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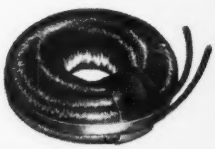

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VIC-6	.084	11.00	VIC-16	8.5	16.50
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VIC-10	.54	14.00	VIC-20	52	16.50
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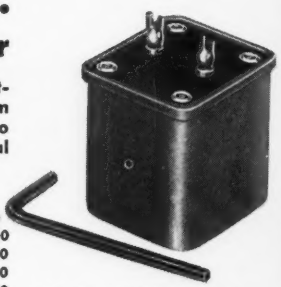

1⅜" L. x 1¼" W. x 1½" H.

United Transformer Corp.

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QST

JUNE 1948

VOLUME XXXII • NUMBER 6

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—CONTENTS—

What hallicrafters MODEL HT-18 variable master oscillator does for improved amateur transmission

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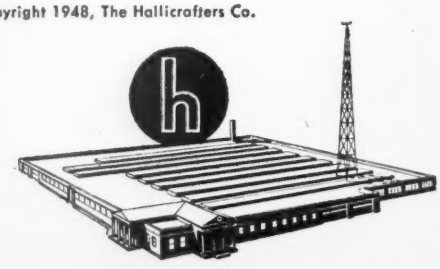

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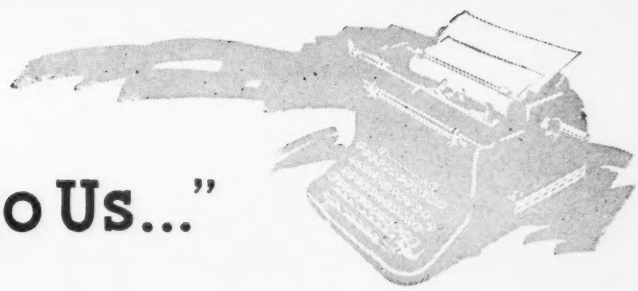


"It Seems to Us..."

F.D. AND PREPAREDNESS

This month there comes what a great many amateurs consider the grandest operating contest of them all, ARRL Field Day. As that week-end arrives, several thousand of us will take to the field in a combination of outing and practical tests, loaded down with portable gear, batteries and gas-engine generators, tents and fly netting, tools and spare wire, logbooks, swimming suits, hamburgers, liniment — all the traditional paraphernalia of Field Day. Assuming only that Nature smiles, a swell time will be had by all.

But let us remember that Field Day is something more than a picnic. We're practising for emergency communication, perfecting our portable apparatus, learning how to succeed in our job when a real emergency comes — as sooner or later it will. So try to learn some lessons from FD and apply them after the fun is over, particularly in remedying any shortcomings of your apparatus.

The supplying of communication when disaster strikes our community is one of the ways in which amateur radio repays society for our operating privileges. It is a duty to be prepared to help. Awareness of the importance of emergency preparedness is attested by the part it plays in ARRL planning and in the expanding membership of our Emergency Corps. The League is already in touch, by the way, with the newly-created Office of Civilian Defense Planning, with a view to knitting our activities into the national needs. We have it in mind, too, that our expected new mobile regulations will considerably facilitate the tailoring of local communication plans by obviating the need to rely exclusively upon v.h.f. for mobile rigs. The v.h.f. gang is right in there, though, as indicated by recent progress toward the establishment of a reliable 2-meter relay route from Maine to the District of Columbia with emphasis on emergency communication.

Now, in between emergencies, there is one thing on which it would be well for us to make a resolution. We propose that we now solemnly resolve that in future emergencies those of us outside the emergency zone, with only personal traffic to handle, will observe better perspective in traffic-handling endeavors than we have done the last couple of times. It is natural that great gobs of such personal messages should come to us whenever there is a major disaster, but whether or not Aunt Bertha is all right can, should and must wait until the priority traffic of the distressed area has been handled — until it has arranged for community medical help, food and shelter. Experienced amateurs know that what we call "agony traffic" is properly a matter to be handled only after the critical stage is over, generally only on the second or third day, and that the fellows in and around the hot spot cannot be bothered about Aunt Bertha right then. Yet in some recent emergencies the night has been made hideous by chaps two thousand miles away yelling emergency, calling for the channel to be cleared, imploring FCC to come to the rescue with a declaration — with nothing more important on the hook than the worried inquiry whether Auntie B. is OK. Let's get perspective on this thing, fellows. Easy does it! Such messages aren't priority traffic. There is no point in getting excited over them. Before attempting to shove them into an emergency area it is important to know that the first and critical phase of providing for communitywide relief is over. Only thereafter can the personal things be handled. First you must find out by listening — on both c.w. and 'phone — just what the score is. Watch the situation, curtail your own transmissions, lay off while conditions are critical unless you're a direct participant. To do otherwise is only to handicap those who have an important job to do in the name of all of us. Emergency procedure in all our nets, by the way, provides for monitoring stations to help keep the net frequency clear for urgent traffic, and so we shall rarely need an FCC order clearing our channels for emergency work. In particular, such a closing order will almost never be justified purely on behalf of the personal-inquiry traffic; let's never ask FCC for one unless the nature of the traffic warrants. Incidentally, keep it in mind that when a major emergency exists there are frequent bulle-

tins from W1AW with dope on the state of FCC orders, best routings to the zone, and pointers on how to help the most and hurt the least.

So, OM . . . when your FD trick is over and you're stretched out on the grass for a spot of rest, think a little on what's behind the FD idea and plan how you'll conduct yourself in the next emergency so that you'll make the biggest contribution to assistance and the biggest addition to the laurels of amateur radio.

THOUGHTS ON TECHNIQUE

Have you realized that amateur radio technique didn't gain nearly as much from technical developments during the last war as many of us had hoped for? It is surprising how little we got out of it technically. To be sure, there is a whole world of startling new techniques in the microwaves, and the apparatus to go with them, waiting for us when we wake up to them, but so far they have interested only a few of us. We have a vast increase in our knowledge of propagation and in the ability to predict performance. We have much improvement in tubes, and better components all around, and the low prices of war surplus have brought good apparatus to many an amateur who otherwise couldn't afford it.

But doesn't it seem that the list stops about there? Nothing of a revolutionary nature applicable to our amateur problems has come to us from the wartime developments, free on a silver platter. We still get our technical advances the hard way, by grubbing them out ourselves in terms of the problems peculiar to congested band-operation. A good prewar h.f. station is still a pretty good postwar one. If you take a quick look at the things that are new — such as s.s.s.c., s.s.r., the Q5-er and all the recent thinking about selectivity — you'll appreciate that they're adaptations of amateur origin, not wartime military magic. Or contemplate the debate in 2-meter circles on whether vertical or horizontal polarization is superior: it's obvious that it's going to be settled on no war-born scientific knowledge but strictly as a matter of practical experience.

Upon balance, we think it's better this way. It wouldn't be good for our souls to have too much new magic handed us for free. We learn more and build our own art more soundly when our developments come from within. And in any event, of course, even the most wondrous of new outside concepts would likely require considerable modification before they could be successfully applied to our specialized problems.

But that reminds us: Even though this is so, we think yearningly of rumors we heard during the war of improved antenna designs for such frequencies as our 3500- and 7000-kc. bands. Nothing seems to have come of them. We're a long way from having the gain on those frequencies that we get with beams or arrays on the higher frequencies. It would be interesting to have some new thoughts to work on in that field, something we could expect eventually to "reduce to amateur practice" to the further improvement of our communication. Has anyone any ideas?

Lest we preen ourselves a bit too much on our technical progress, however, it needs to be said that we have too many bad signals on the air. We understand that FCC took advantage of our recent DX brawl to do a bit of concentrated monitoring and that they nabbed several hundred of us for this or that. We would gather that a goodly number of the lads were found outside the bands or outside the 'phone subassignments. The rules of the DX contest are so rigidly applied that we doubt very much that these cases represented intentional villainy or unsportsmanlike tactics. We think these chaps just leaned a little too hard against the band-edge and that their measuring techniques weren't good enough to stand up in the heat of battle. In other words, these cases represent technical insufficiency in our stations or plain poor operating practice under pressure. We also understand that some scores of the boys have recently received FCC greetings on such assorted topics as chirpy notes, inadequate filtering, spurious emissions including overmodulation products and harmonics, and key clicks. Of course these are definitely indicative of technical inadequacies in our stations. The way we see it, all of this means that there are still lots of things that we need to do in our individual shacks to make the heaps behave and put out more creditably.

Good thing we never run out of things to do, isn't it? Where would the game be if there were no technical problems, no new frontiers?

FEED-BACK

David H. Atkins, coauthor of our March article, "500 Watts of Audio from AB_1," advises that C_5 in Fig. 6 should have a value of 0.01 μfd., not 0.1 μfd.; also that one of the three VR-150 regulator tubes of Fig. 3 should be changed to a VR-90 or VR-105 to make the screen potential approximately 500 volts. No changes are required in the series dropping resistors.

A drafting error in Fig. 1 of Paul D. Rockwell's "A Balanced-Modulator N.F.M. Exciter," April *QST*, caused the rotor of S_{1B} to be grounded instead of the switch tap connecting to the lower terminal marked "VFO Input." Sorry.

A Detector for Single-Sideband Reception

Eliminating the Unwanted Sideband by Phase-Shift Networks

BY OSWALD G. VILLARD, JR.,* W6QYT, AND DAVID L. THOMPSON,** W6VQB

• We're so used to getting our selectivity by tuned circuits that it may be startling to most of us to find that there are other ways of getting it — maybe better ways. This article describes a single-sideband detector circuit that inherently eliminates the unwanted sideband, entirely independently of the selectivity of the receiver with which it is used. The experimental model described here can be simplified considerably, as the authors point out.

In an earlier paper the basic principles of a.m. and single-sideband detection were reviewed.[1] It was pointed out that a change to s.s.s.c. transmission makes possible a considerable increase in the effective selectivity of present-day a.m. receivers, whose ability to reject interfering signals leaves much to be desired. To take full advantage of the benefits of s.s.s.c., a balanced detector (which eliminates interference attributable to rectification) may be added to existing sets, and this may be followed by a sharp cut-off low-pass audio filter for additional selectivity. The only disadvantage of such an arrangement is the audio "image" — the audible output produced by an incoming radio frequency on the side of the beating oscillator opposite to that of the desired signal. There will be described in this article a method of eliminating this "image" which makes possible the design of an inexpensive single-sideband receiving attachment for standard amateur receivers. The effective selectivity of a receiver equipped with this attachment is surpassed only by the most elaborate commercial installations. Single-sideband transmission, plus this receiving technique, now makes possible for the first time a truly complete utilization of the spectrum available in the amateur 'phone bands — something which is hardly possible with conventional a.m. and present-day equipment.

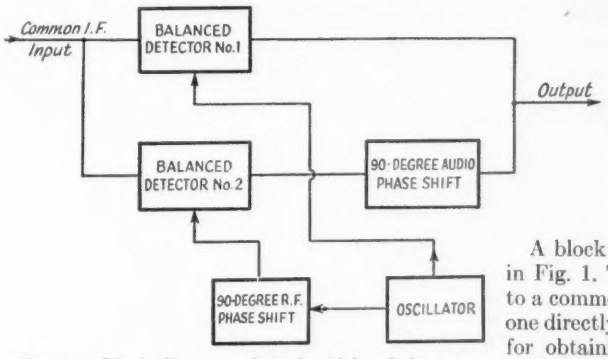


Fig. 1 — Block diagram of single-sideband detector utilizing 90-degree r.f. and a.f. phase shifts.

The method is based on the relatively recent development of simple 90-degree wide-band phase-shift networks.[2] A typical network of this sort, consisting of 6 resistors and 6 condensers, is capable of dividing a common audio input into two parts whose magnitudes are nearly equal, and whose relative phases are nearly 90 degrees, over a band of frequencies extending from 300 to 3000 cycles. One of the many applications of the networks mentioned in the referenced article is the generation of single-sideband radio signals. It is therefore not surprising that these same networks may be used in a somewhat analogous manner to make possible single-sideband reception.

A block diagram of the basic system is shown in Fig. 1. Two balanced detectors are connected to a common i.f. input. Oscillator voltage is fed to one directly, and to the other through some means for obtaining a 90-degree r.f. phase shift. The audio output of the second balanced detector is delayed 90 degrees by means of a suitable network, and is then combined with that of the other.

The method of operation may be visualized with the aid of the vector diagrams of Fig. 2. It is assumed for simplicity that the incoming signal is pure c.w. The reasoning is equally valid, however, if more than one incoming c.w. signal is present, or if (which is the same thing) the incoming signal is a modulated wave consisting of carrier and sidebands. A vector diagram may be likened to a high-speed flash photograph: it is a way of viewing the situation when all action is "stopped." We may tag each a.c. voltage being studied (no matter what its frequency) and examine its instantaneous relationship to the

* Department of Electrical Engineering, Stanford University, Calif.
** Building 202, Stanford Village, Stanford University, Calif.

[1] O. G. Villard, jr., "Selectivity in S.S.S.C. Reception," *QST*, April, 1948.

[2] R. B. Dome, "Wide-Band Phase-Shift Networks," *Electronics*, December, 1946.

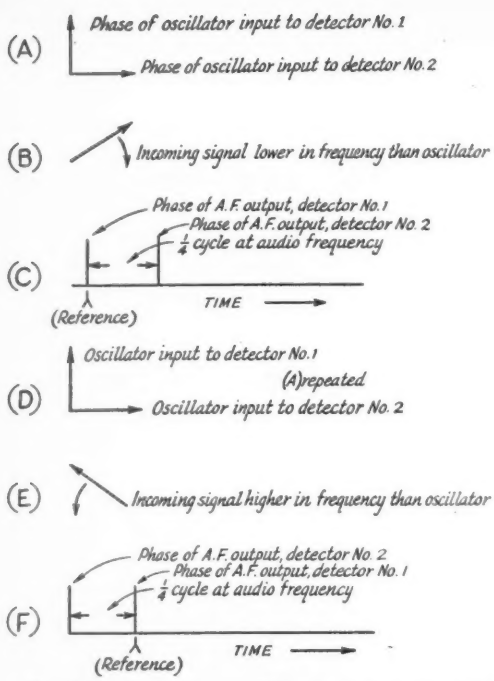


Fig. 2 — Vector diagrams illustrating the operation of the single-sideband detector.

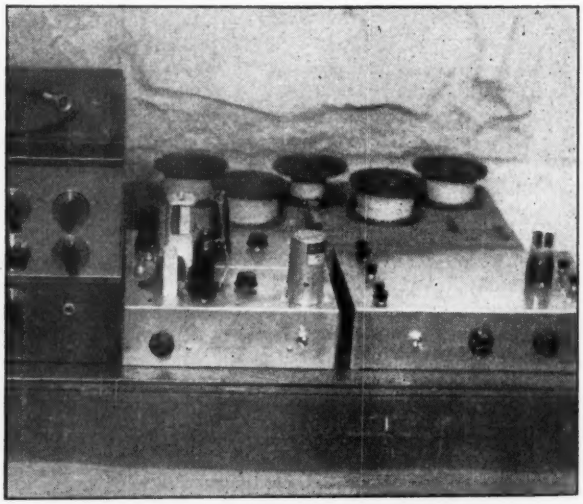
others. A succession of vector diagrams resembles a stroboscopic view: If we flash the lamp in synchronism with one of the a.c. voltages, that particular one will appear to be stationary. Voltages of a frequency slightly higher than our reference will appear to rotate in one direction, while those lower in frequency will rotate in the other.

Fig. 2-A is a representation of the relative phases of the oscillator voltages being fed to Detector 1 and Detector 2. These two voltages will be taken as reference — i.e., our stroboscope is flashing at the oscillator frequency and these vectors will always appear stationary. The vector in B, however, represents an incoming signal lower in frequency than the oscillator; consequently it would be found to be rotating clockwise if a succession of vector diagrams were drawn. This motion is indicated by the curving arrow. It can easily be seen that this rotating vector will be parallel to that of the oscillator input to Detector 1 *before* it becomes parallel to that of the input to Detector 2.

We may consider the instant in time at which these vectors are in phase as a reference point in the audio output of the two detectors, since it is a characteristic of frequency translation of this sort that audio phase relationships are exactly determined by radio-frequency phase relationships. Fig. 2-C represents the audio outputs of the two detectors plotted as a function of time. The vertical lines represent the instants in time at which the incoming-signal vector is in phase with the two oscillator voltages, and therefore will equally well represent the relative phase of the audio output of each detector. It is quite apparent that the output of Detector 1 has a phase which is 90 degrees ahead of the output of Detector 2.

In E, the counterpart of B, the incoming frequency is higher than that of the oscillator, and therefore its vector rotates counterclockwise. Under these conditions this vector becomes exactly in phase with that of the input to Detector 1 *after* it has become in phase with that of Detector 2. The audio output of Detector 1 now has a phase which is 90 degrees behind that of Detector 2.

Now let us suppose that we delay the audio output of Detector 2 by one-quarter cycle, as shown in Fig. 1, by means of a 90-degree wideband audio phase shifter. The output of Detector 2 will wind up one-half cycle behind that of Detector 1 in C of Fig. 2 (i.e., the two voltages will be 180 degrees out of phase), whereas in F the delayed output of Detector 2 winds up exactly in phase with that of Detector 1. This is the basis on which the scheme works — for c.w. or single-sideband signals lower in frequency than the conversion oscillator, the two detector outputs cancel; for signals higher in frequency, they add up in phase. By reversing the polarity of the oscillator voltages (or that of the detector outputs) the detector may be made to respond to



Experimental set-up using the single-sideband detector. The separate i.f. oscillator and the two balanced detectors are to the right of the receiver. The chassis housing the 90-degree phase-shift networks, the sideband selector switch, and the 6SL7 tube is to the right. In the background is the low-pass audio-filter unit.

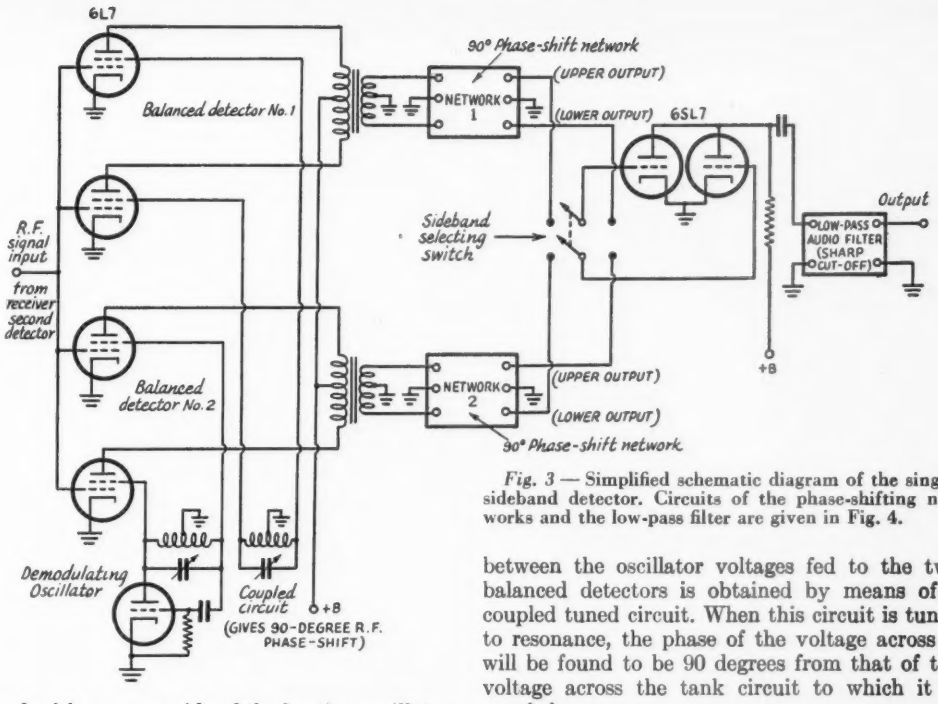


Fig. 3 — Simplified schematic diagram of the single-sideband detector. Circuits of the phase-shifting networks and the low-pass filter are given in Fig. 4.

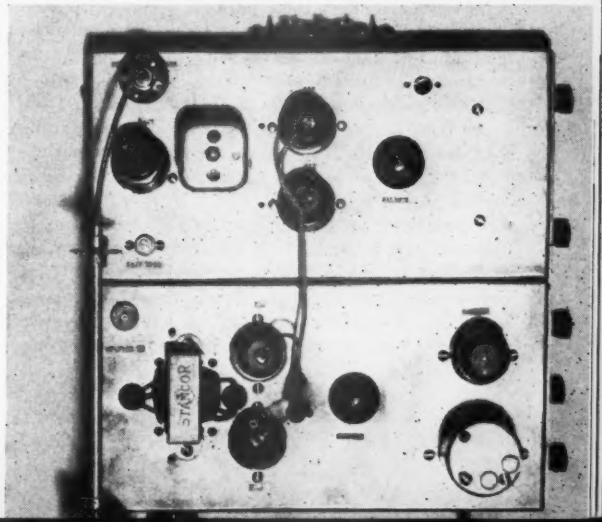
signals either on one side of the beating oscillator or the other.

Practical Circuits

Fig. 3 is a simplified schematic showing how two balanced detectors, two 90-degree phase-shift networks, and a low-pass filter may be combined to make up a single-sideband detector. The circuits of the phase-shift networks and of the low-pass filter are shown in Fig. 4. A complete schematic of the entire unit is given in Fig. 5. This unit is by no means the best way to carry out the functions indicated in the block diagrams — it merely represents a first experimental model whose only merit is that it does work! It is hoped that it will serve, however, to illustrate the principles involved.

Referring to Fig. 3, the 90-degree phase shift between the oscillator voltages fed to the two balanced detectors is obtained by means of a coupled tuned circuit. When this circuit is tuned to resonance, the phase of the voltage across it will be found to be 90 degrees from that of the voltage across the tank circuit to which it is coupled.

It will be noted that *two* 90-degree audio phase-shift networks of the type shown in Fig. 4 are required. The reason for this is that while each network produces two output voltages 90 degrees apart in phase, the relative phase of these two voltages bears no fixed relationship to that of the input voltage. Therefore two identical networks must be used in order to get the necessary 90-degree audio delay between the outputs of the two detectors. Fig. 6 gives vector diagrams illustrating the action. A c.w. input signal is assumed; therefore the audio output is sinusoidal. In A, the relative phase of the audio output of the first balanced detector is shown. This is split into two portions, 90 degrees apart in phase, but bearing no fixed phase relationship with the input voltage. It is assumed that at the particular



Top view of the balanced-detector chassis. The i.f. tuning control for r.f. phase shifting is brought out to the front by means of a flexible shaft. The large knob is the oscillator tuning control.

audio frequency chosen for the example, the phase shift between input and output happens to be that shown. Fig. 6-B shows the output of the second balanced detector, and it will be seen that the upper output voltage of Network 1 is of just the right phase to cancel the lower output of Network 2. C and D show how the situation is reversed when the incoming signal is on the other side of the oscillator frequency.

Two other characteristics of the phase-shifting networks should be mentioned. It will be observed that each requires a push-pull input; this is essential for their correct operation. The output impedance of the two networks is very high, and as a result it does not appear to be possible to connect them in series or in parallel without upsetting their normal operation. For this reason their outputs are combined in the 6SL7 twin triode.

The "sideband selecting switch" in Fig. 3 makes it possible to listen to c.w. and s.s.s.c. signals either higher or lower than the oscillator frequency, the others being rejected. The reason for this can be seen by following through the vector diagrams of Fig. 6.

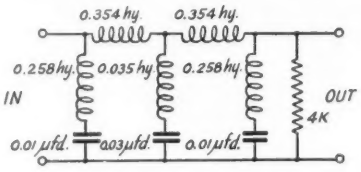
Notes on Circuit Details

Construction of the phase-shift network of Fig. 4 offers only one difficulty. The values actually used should be as close to those shown as possible. It has been found that reasonably good performance is obtained if the values are matched to within plus or minus 5%; but the closer the match, the better the network may be expected to perform. Since the condensers and resistors most commonly used have a tolerance of the order of plus or minus 10%, it is very desirable to check the actual values on both resistance and capacity bridges. Most well-equipped radio service shops have both types, and the job of picking values close to the desired is not an especially tedious task when a large assortment is available.

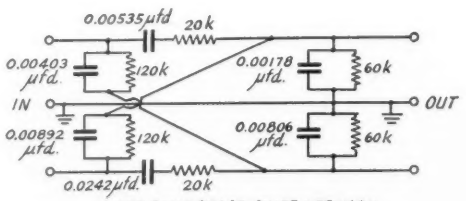
If picking items from an assortment is too time-consuming, an alternative method is to measure a condenser or resistor accurately (no matter what its value, provided it is less than that desired) and then parallel or series it with additional units whose rated values make up the difference. The error will then be small. As an example, suppose one wanted to make up a 0.00535-μfd. condenser. A 0.005 is picked from the box, which when measured is found actually to be 0.00510. This may be paralleled with a 0.00025 10% tolerance condenser to give 0.00535 plus or minus 0.2%.

The low-pass filter shown in Fig. 4 happens to be an experimental unit left over from another job, and its description is included here merely for the sake of completeness. It is fairly easy to make. Since the design of such filters has been widely discussed in connection with speech-clipping circuits,[3] no comment is needed here, other than that filters of this type are now commercially available. Since the phase-shifting networks are good up to 3000 cycles, a filter cut-off frequency of 2500 cycles may seem unnecessarily low; however, it is found to be perfectly satisfactory in practice from the standpoint of intelligibility, and gives greater effective selectivity.

Fig. 5 looks quite a bit more complicated than Fig. 3, but most of the extra details are circuit components added for the sake of convenience in the experimental model. Much could have been cut out if economy had been the primary consideration. Coupling to the last i.f. stage of a standard communications receiver (in our case a National NC-200) is accomplished by means of



LOW-PASS FILTER
2500-CYCLE CUT-OFF



WIDE-BAND PHASE-SHIFT NETWORK
300-3000 C.P.S.

Fig. 4 — The low-pass filter and wide-band phase-shift network. In the phase-shift network the values shown should be matched as closely as possible. The filter coils used in the experimental unit shown use No. 25 s.c.c. enamel wire scramble-wound on wooden spools 1⅜ inches in diameter and 2 inches between sides. The 0.354-henry coils have 1.74 pounds of wire each, the 0.258-henry coils 1.5 pounds, and the 0.035-henry coil 0.64 pound. The sides of the spools are 4⅜ inches in diameter.

a 6C4 cathode-follower tube built into a plug-in adapter. The second detector of the receiver is removed, the adapter containing the 6C4 plugged in, and then the detector tube is plugged into the adapter. The 6C4 derives its filament and plate currents (which are negligible) from the receiver, and provides a low-impedance i.f. output of several volts for connection to the single-sideband

[3] W. W. Smith, "Premodulation Speech Clipping and Filtering," *QST*, February, 1946; W. W. Smith, "More on Speech Clipping," *QST*, March, 1947; J. W. Smith and N. H. Hale, "Let's Not Overmodulate," *QST*, November, 1946; Galin, "Audio Filters for the Speech Amplifier," *QST*, November, 1947.

detector. The grid of the 6C4 connects to the secondary of the last i.f. transformer, the other side of which is grounded. Addition of the 6C4 necessitates only a very slight retuning of the i.f transformer to restore perfect alignment.

The i.f. signal from the 6C4 is attenuated by means of a small variable condenser to approximately 1 volt r.m.s. (for full NC-200 r.f. gain) before being applied to the paralleled control grids of the 6L7s. Connected to the plates of each pair of 6L7s is a small step-down transformer of the Class AB driver type (turns ratio primary to ½ secondary = 3:1). The step-down is needed to provide a low source impedance with which to feed the networks. To prevent resonances in the transformers, swamping resistances of 10,000 ohms are connected across each half of the primaries. Their use is essential. The 50,000-ohm

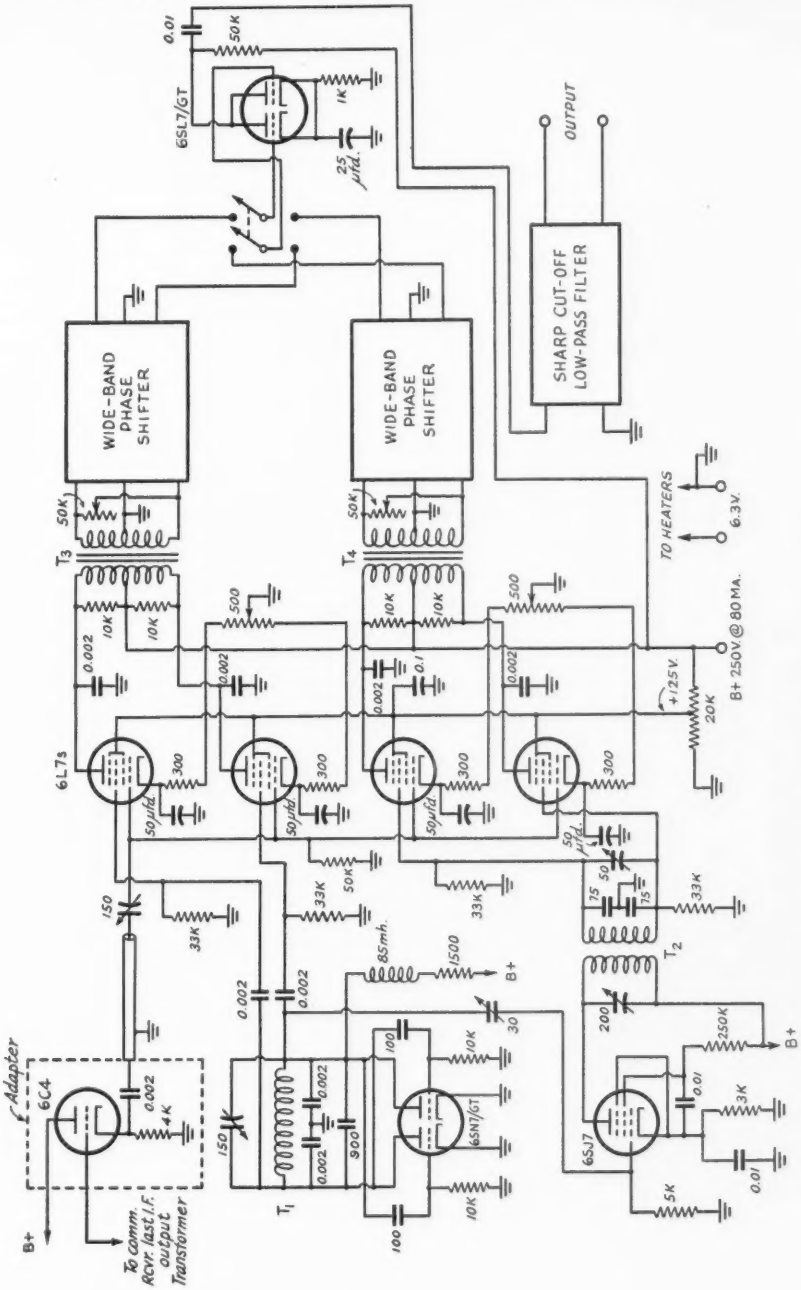


Fig. 5 — Complete circuit of the experimental single-sideband detector unit. The circuits of the phase-shift networks and low-pass filter are given in Fig. 4. Transformers in the diagram shown above are as follows:

T_1 — Approx. 65 μhy. (broadcast-band antenna coil with primary and some secondary turns removed).

T_2 — 450–475-kc. i.f. transformer (Miller 512-C11) with secondary condenser removed and 75-μμfd. condensers substituted, as shown.

T_3, T_4 — Audio transformer, turns ratio primary to ½ secondary: 3:1 (Stancor A-4712).

variable resistors connected across the transformer secondaries may be adjusted to equalize the outputs of the two detectors so that complete cancellation can take place when the correct phase relationships exist.

The oscillator was made push-pull, although it could equally well have been single-ended. Both balanced detectors require oscillator voltages of opposite phase, however. A 6SJ7 buffer tube is used between the oscillator and the phase-shifting coupled circuit, in order to prevent any reaction on the frequency of the oscillator caused by tuning the secondary of the phase-shifting i.f. transformer. (By connecting the coupled circuit to the plate of an electron-coupled oscillator, it would have been possible to eliminate the buffer tube while still providing isolation between this circuit and the oscillator tank.) The 6SJ7 is not required to produce any gain; therefore its input from the oscillator is cut down by use of a small coupling condenser. Resistance loading of the i.f.-transformer secondary can also be used to reduce the gain and has the advantage that the circuit *Q* is thereby reduced, making the tuning less critical. The desired phase shift is obtained by tuning this circuit, and when it is at resonance, the phase shift will be approximately correct. However, at resonance the rate-of-change of phase with tuning is greatest, and is proportional to the circuit *Q:* hence it is desirable to make the tuning less critical and the phase setting easier by reducing the secondary *Q*.

Testing & Adjustment

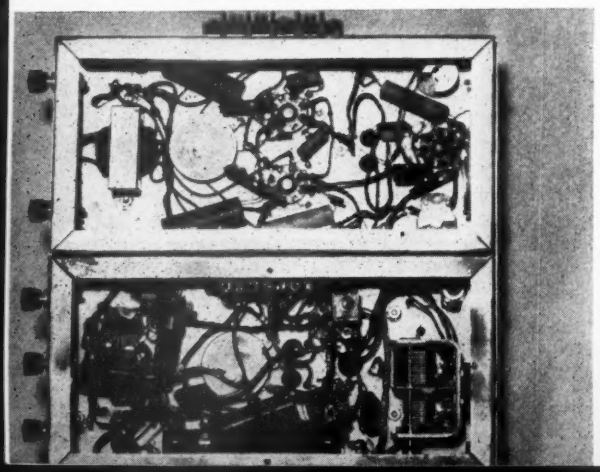
Testing and tuning up the circuit is quite straightforward. The first step is to see that the correct oscillator voltages are applied to the 6L7s. (A 20,000-ohm-per-volt voltmeter plus a crystal rectifier makes a convenient substitute for a vacuum-tube voltmeter, as suggested by WØTQK.)[4] The injector grids may have up to 15 volts r.m.s. applied, in accordance with conventional converter practice. It is desirable that all four tubes receive roughly the same oscillator voltage. Maximum voltage at the signal grids should be held to one or two volts r.m.s. The balanced detectors are balanced by applying a strong a.m. signal with the oscillator detuned. The cathode resistors are then adjusted for minimum audio output.

If the phase-shift networks have been constructed with accurately-measured components, they may be relied upon to operate as planned. To test them, only a variable-frequency audio oscillator and an oscilloscope are required. For best results, the networks should be fed from the oscillator via a push-pull audio transformer of fairly good quality, preferably of the step-down variety. The horizontal and vertical amplifiers of the oscilloscope are then connected to the two network output terminals, and the relative gains adjusted until the pattern becomes as nearly circular as possible. The audio frequency may then be varied from 300 to 3000 cycles; if the pattern remains approximately circular over this range, the network is functioning properly. It is important that both networks behave as nearly alike as possible. Actually, even if the network design values are duplicated exactly, the patterns will not remain precisely circular over the range because in a simple network of this sort both phase and amplitude deviate somewhat from the ideal condition. However, the phase should hold within a few degrees and the amplitude within a few per cent.

While set up for this test, it is interesting to feed a voice signal into the network and observe the result. A complex voice wave produces a remarkable pattern of curlicues and circles within circles — a pure "pear-shaped" tone, of course, always produces a circle no matter what the frequency, provided it is within the range of the network. It is possible that patterns of this sort might be useful for voice training, or in connection with teaching the deaf to speak.

With the detectors balanced, the networks connected, and the oscillator at the correct frequency, the radio-frequency phase shift must be set. Tuning the i.f.-transformer secondary to resonance will give approximately the correct setting. An easy way to find the correct setting exactly is to connect the horizontal and vertical plates of a 'scope to the outputs of the two balanced detectors. With a c.w. signal applied to the input and adjusted to a frequency that produces, say, a 1000-cycle beat note, the tuning is adjusted until

[4] A. H. Nichols, "A Single-Sideband Transmitter for Amateur Operation," *QST*, January, 1948.



Bottom view of the balanced-detector chassis.

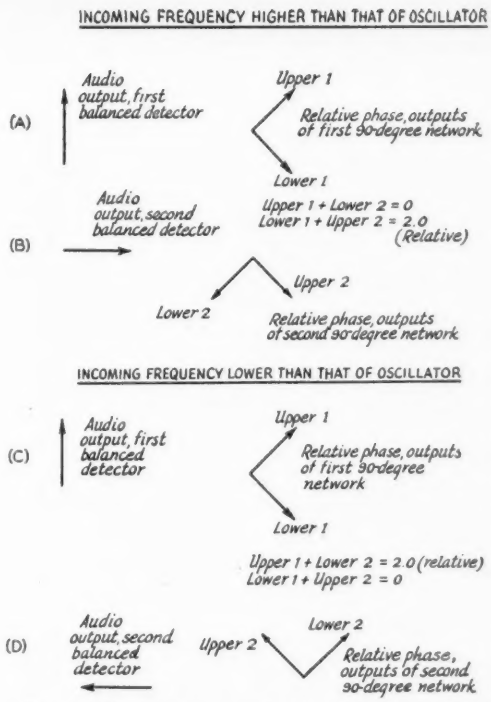


Fig. 6 — Vector diagrams showing operation of the practical detector circuits of Figs. 3 and 5.

the pattern on the oscilloscope is a perfect circle. It should be a perfect circle when the incoming signal is on either side of zero beat, and its shape will not be dependent on the exact frequency of the beat note. If the incoming signal is modulated with speech or music, it may be possible to see the direction of rotation of the 'scope pattern reverse as the incoming signal slowly passes through zero beat!

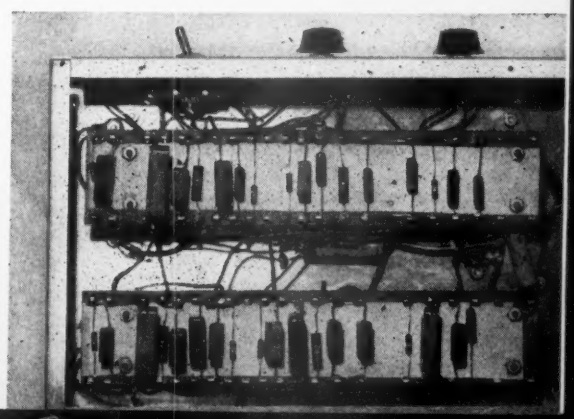
Once the correct r.f. phase has been found, it should be possible to observe a noticeable difference in output when the sideband selector switch is thrown. (It is assumed that a steady c.w. signal on one side of zero beat has been tuned in.) With the switch thrown to the position at which the signal is weaker, the two amplitude-balancing resistances (across the audio-transformer secondaries) may be adjusted for greatest rejection of the incoming signal. These resistors could be ganged in such a way that when one opens the other closes, and one control would thereby be eliminated.

The single-sideband detector is then ready to go. Its output may be fed back to the audio input of the receiver, or it may be fed to a separate amplifier. By touching up the r.f.-phase as well as the amplitude-balance controls, it is possible completely to eliminate a signal on the wrong side of zero beat. The procedure is much like balancing a bridge. Changing the r.f.-phase setting, as well as the amplitude balance control, compensates for any deficiency in the audio-phase-shift networks, both as to output phase and amplitude. However, it should be realized that these deficiencies can only be compensated for at one audio frequency; at all others, the balance will again be imperfect and some signal will be heard. Therefore it is best to choose a frequency of roughly 1000 cycles, where the ear is most sensitive, for perfect cancellation; at other frequencies, some signal will leak through because of imperfect operation of the phase-shift networks, but the leakage will then not be quite so noticeable.

The solid curve in Fig. 7 is the ratio of the input to the output voltage of the low-pass filter as a function of frequency. The dip at 5200 cycles represents the frequency at which the shunt M-derived end sections are series-resonant. It is seen that signals 10 kilocycles away from the beat-oscillator frequency are attenuated 1000 times by this filter — in other words, its selectivity is equivalent to that of the i.f. stages of, say, an NC-200 receiver! For reference, the selectivity curve of this receiver is plotted as the dotted curve in Fig. 7. The over-all response curve of an NC-200 followed by this filter would, of course, be the product of these two curves.

An idea of the image-signal or unwanted-sideband rejection made possible by the two 90-degree networks, whose R and C values are within plus or minus 5%, may be gained from the following typical measurement:

Frequency	*Ratio, Desired to Undesired Sideband (Voltage)*	*(db.)*
300 c.p.s.	10	20
500	17	24.6
600	50	34
650	100	40
900	100	40
1000	65	36.2
1500	17	24.6
2500	20	26



Underneath the phase-shift network chassis. The two networks side by side are electrically the same, although the components are not always identical.

The shape of this curve is to a large extent dependent on the exact frequency chosen for perfect balance — in this case somewhere between 650 and 900 cycles.

In operation, this amount of rejection is reasonably adequate. (Selection of condensers and resistors of closer tolerance would probably have meant still better performance.) It is very striking to be able to throw the sideband selector switch, when listening in a crowded c.w. band, and hear an entirely different set of signals! An attachment of this sort effectively halves the bandwidth of the c.w. receiver, thereby removing half of the signals one would normally hear.[5] A remarkable feature is that this great increase in selectivity is obtained without resort to crystal filters or other highly-selective circuits which require great stability or careful tuning for proper operation.

Another remarkable feature is the fact that two audio outputs can be provided, so that two operators can listen simultaneously and without interference to the output of the same receiver —

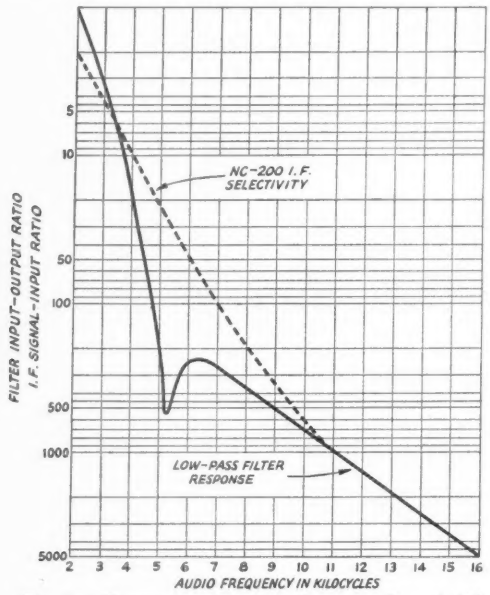


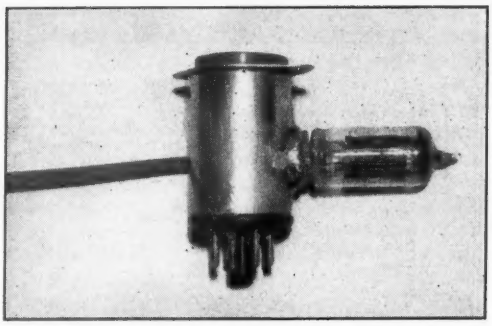
Fig. 7 — Response curve of the low-pass filter (solid curve). A typical receiver selectivity curve is shown for comparison (broken curve).

one hearing all signals lower than the beat oscillator, and the other all those higher. It is only necessary to add a second 6SL7 connected to the unused terminals of the 90-degree networks in Figs. 3 or 5. This ought to be an ideal arrangement for more-than-one-operator stations in DX or SS contests; each operator can listen for replies to CQs on his particular side of the transmitter frequency!

It must be remembered, when tuning in single-sideband signals, that the selector switch must be thrown to the correct position. If it is on the position which rejects the sideband being transmitted, the station will be heard very poorly.

In certain types of s.s.s.c. transmitters, it is possible to select the sideband transmitted at will. When, at the receiving end of a circuit, the receiver is equipped with a sideband selector, it is possible to change frequency instantaneously from one sideband to the other merely by throwing a switch. Thus a QSY of one channel-width can be accomplished without any retuning. In ham work, this should be ideal for avoiding QRM.

[5] The authors refer here to a "straight" super — one without a crystal filter. — *Ed.*



Close-up of the plug-in adapter unit for connecting to the receiver.

Strays

Numerous BCLs in Kendallville, Ind., complained loudly about the radio ham who was making it impossible for them to hear any programs. They carried their demands that something be done to the local politicos. It was, too. Intensive investigation disclosed that the cause of all the listeners' woe was centered right in City Hall — not high-powered oratory, mind you, but a high-tension line carrying 2300 volts which was arcing over at intervals! — *Indianapolis Star, via W9RDW*

—•••—

We're in, gang! The new *American College Dictionary* (Random House), distributed by the Book of the Month Club, gives listing to the expression "ham radio," defining it as slang for "an amateur; a radio ham." — *W1BT*

—•••—

Nonmetallic permanent magnets, known as "Electrets," are now being made of plastics, usually by solidifying a molten wax in a strong d.c. electric field. — *Ohmite News*

—•••—

"Amateurs modifying surplus gear and looking for a solvent for Glyptal will find a friendly ally in ethylhexanedoil, commonly sold as the insect repellent '612.' Twelve hours after the solution is applied, the Glyptal will brush off." — *C. F. MacLean*

Swell tip, Mac; we'll try it. But please tell us, OM: Do you think the stuff also might help in debugging that pestiferous 807 of ours?

Amplifier Instability in Transmitters

Its Investigation and Treatment

BY DONALD H. MIX,* W1TS

• Although quite a bit has already been published about how to build and adjust amplifiers in transmitters, it is apparent that what has been said hasn't been entirely adequate, for many still have trouble confining the output to one frequency at a time. This article reviews some of the measures for stabilizing triodes and tetrodes suggested in the past, finds that some of them can be improved upon, and ends up with an arrangement that gives a reasonable guarantee of complete freedom from amplifier oscillation in any form, without relying on loading as the stabilizer. It should be of particular interest to those having trouble with 807s.

MUCH has been written on the subject of stabilizing r.f. amplifiers in transmitters. And yet many of us are still having plenty of trouble with the various types of instability to which modern tubes with their high power-sensitivities seem to be prone. Still others are operating unconscious of the probability that much of the widespread clicking and splattering within the bands, as well as spurious signals frequently found outside, may originate in an unstable amplifier which appears on the surface to be quite innocent of such transgressions. No amount of click filtering will remedy this sort of trouble, of course. The fact that an amplifier doesn't oscillate when fully loaded and biased to cut-off is no guarantee that it may not take off intermittently with keying or modulation, or when detuned from some fortunate adjustment. Neither is a clean signal at the operating frequency proof that parasitic oscillation at some other frequency is not taking place simultaneously. The power sensitivity of beam tetrodes in particular is so great that oscillation of one type or another can hardly be avoided unless more-than-ordinary precautions are taken.

For the sake of completeness, some of the following will constitute repetition of things that have been said before. In the light of more extended experience, some principles which have been more or less generally accepted will have to be questioned. It is believed, however, that it is now possible to point toward a procedure which seems to give reasonable assurance of real stability without the need for complications in construction or difficulties in adjustment. Except for the specific references to the screen, the remarks and circuits which follow apply to triodes as well as beam tetrodes. Under the measures to be prescribed, it has been possible to operate a pair of 807s in push-pull at zero bias, without load, running at an input up to the rated plate-dissipation level, with no sign of instability of any kind. Most users of 807s will agree that this is not a usual experience.

* Assistant Technical Editor, *QST*.

Checking Procedure

Transmitter amplifiers are subject to one or more of three common modes of oscillation, all of which appear to be of the t.g.t.p. variety. There may be others but they are not often encountered. In addition to oscillation at the operating frequency (the frequency to which the amplifier is tuned by the conventional input and output tank circuits), parasitic oscillation at frequencies in the vicinity of 150 Mc. will almost invariably take place in both triode and tetrode amplifiers unless steps are taken to suppress it. The plate-grid capacitance of tetrodes designed for transmitter use is seldom sufficient to support t.g.t.p. oscillation at low frequencies. But parasitic oscillations at frequencies as low as 100 kc. have been experienced with triodes and poorly-screened audio tetrodes, such as the 6L6 and 6V6, when suitable circuits have been permitted to exist.

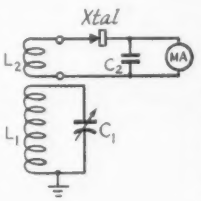


Fig. 1 — Diagram of indicating absorption wavemeter for checking amplifier instability. L_1C_1, with plug-in coils, should cover a range from 200 Mc. to 200 kc. L_2 is a pick-up coil of several turns coupled to L_1. The crystal is a Type 1N34. C_2 by-passes the meter (1-ma. scale). The portion of the circuit to the right of L_2 is used as a neutralizing indicator.

Troubles of this sort often are difficult to diagnose under normal conditions of bias and load. The best step toward assurance that transient oscillation won't take place during normal operation is to adjust voltages and reduce loading so that conditions are favorable for sustained oscillation, when observation is easier, and then devise means for suppressing it. This can be done by using grid-leak bias with no fixed bias and operating the amplifier without load, reducing screen and plate voltages as necessary to limit the input to the rated dissipation level. Each stage in the transmitter should be tested separately. The only tool required, in addition to the usual

grid and plate milliammeters, is an indicating absorption wavemeter of the type described in the last several editions of *The Radio Amateur's Handbook*. The diagram is shown in Fig. 1. Incidentally, this little gadget is something no ham should be without. It has many important uses around a transmitter.

V.H.F. Parasitics

Parasitics in the v.h.f. range perhaps are the easiest to segregate. Apparently the oscillatory circuit is composed principally of the leads from the grid and plate to their respective tanks, series-tuned by the tank condensers, as indicated by the heavy lines in Fig. 2-A. The same sort of circuit exists if the tank is balanced. It is chiefly with this circuit in mind that the importance of short leads often is stressed, the theory being that if the leads can be made short enough, the resonant frequency will be so high that the circuit losses will prevent oscillation. Unfortunately this objective seems hardly possible of attainment, since even if the lead length could be reduced to zero, there remains the inductance of the tank condenser and the leads within the tube.

Before turning on the amplifier power, the 10-meter grid coil (the plate tank coil of the driver in the case of capacitance coupling) and the 80-meter plate tank coil should be plugged in. This is to make sure that the amplifier can't oscillate at other frequencies by means of the regular tank circuits. The tank coils should not be short-circuited as an alternative, because the amplifier may oscillate at a frequency determined by the inductance of the shorting leads! A jumper should be placed across the plate r.f. choke if one is used. Thus whatever oscillation takes place will be confined pretty well to the v.h.f. parasitic we're looking for. If the stage is an intermediate one, the tubes in the preceding and following stages should be removed to eliminate loading. If a Variac isn't available, a lamp socket can be connected in series with the plate-transformer primary and lamps of various sizes tried until one is found that will limit the power input to the amplifier to just under the dissipation rating. Screen voltage, in the case of a tetrode, should be obtained from the plate supply through a dropping resistor of recommended value.

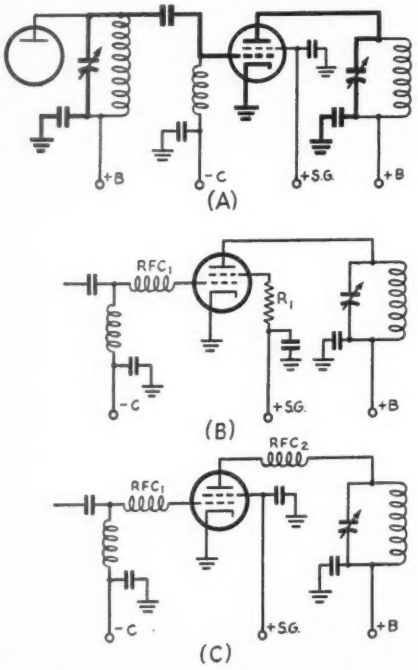


Fig. 2 — A — V.h.f. parasitic circuit hidden in high-frequency amplifier. B — Common method of suppressing v.h.f. parasitic with tetrodes. R_1, however, is not recommended. C — Recommended circuit for beam tubes. Chokes in both plate and grid suppress v.h.f. parasitics without the disadvantages of B. Suggested dimensions for RFC_1 are 15 turns No. 22 wire, ¼-inch diameter, close-wound; for RFC_2, 8 turns No. 14 wire, ¾ inch long, self-supporting (see text).

With power applied to the amplifier only, a careful search should be made by adjusting the grid tank condenser to several settings, especially including minimum and maximum, and turning the plate tank condenser through its range for each of the grid-condenser settings. Any grid-current reading or any dip or slight flicker in plate current indicates oscillation. This can be confirmed by using the absorption wavemeter held close to the plate lead of the tube. As the wavemeter will indicate, when tuned to obtain a deflection, the parasitic usually falls somewhere in the vicinity of 150 Mc., regardless of whether the tube is a triode or a tetrode. The oscillation may take place only at a certain combination of tank-condenser settings, but it may happen to be just the one most used in normal operation of the amplifier.

The most common way of suppressing v.h.f. parasitics with tetrodes has been to use a small choke in the grid lead in conjunction with a small unby-passed noninductive resistor at the screen, as shown in Fig. 2-B, RFC_1 and R_1. While this combination seldom fails to suppress the parasitic, it has been found that even a small amount of resistance — as low as 10 or 12 ohms — used in this manner has a very serious effect upon the plate-grid isolation at the operating frequency.

In searching for an alternative method of suppressing a v.h.f. parasitic with 807s, tuned traps were tried at the grid, at the plate and in both positions simultaneously. While this was effective over a portion of the tank-condenser range, the condenser changed the frequency of the parasitic enough so that one adjustment of the trap would not hold over the entire range. On the chance that a long plate lead might result in a parasitic plate circuit tuned to a frequency lower than that of the grid where the t.g.t.p. circuit, if it was such, could not oscillate, the plate lead was

lengthened. This proved to be a complete remedy, although the grid choke is necessary also, for a reason that isn't quite apparent. Accordingly, the plate lead, which was about a foot long, was wound into a coil and inserted close to the plate, as shown in Fig. 2-C, RFC_2.

In several 807 amplifiers built within the last couple of years — single tube, tubes in parallel or push-pull — a grid parasitic choke of about 15 turns of No. 22 wire close-wound on a ¼-inch form has always worked. It seems to be critical only to within a turn or two. With this as a starting point, the plate lead should be lengthened until oscillation ceases, making sure that the long plate lead is kept well away from the input circuit. When the minimum length has been found, the wire can be wound on a small-diameter form and inserted in the plate lead close to the tube terminal. The ones we have used with success in a push-pull 807 amplifier consist of 8 turns of No. 14 wire, 5/16-inch inside diameter, ¾ inch long, self-supporting. Since there has been insufficient time for extended experience with this arrangement in other amplifiers, it is possible that these dimensions may need changing in another layout.

A grid choke of the dimensions given above usually suffices to quench v.h.f. parasitics in triode amplifiers. In stubborn cases, a tuned trap consisting of 4 turns of No. 14 wire, ½ inch in diameter, ¾ inch long, tuned by a 30-$\mu\mu$fd. mica trimmer inserted in the plate lead, may be required. No grid choke is used.

Low-Frequency Parasitics

So much for v.h.f. parasitics. Attention can now be turned to any low-frequency parasitic which may exist. As stated previously, a parasitic of this mode seldom is experienced with well-screened tubes. But it is just as easy to arrange the circuit so that it *can't* happen anyway. Oscillations of this type may take place in amplifiers where r.f. chokes are used in both plate and grid circuits when coupling and blocking condensers or, more often, the tank condensers themselves combine with the chokes to form tuned circuits of low frequency. The belief that a sequence of r.f. chokes in a succession of parallel-fed circuits in itself necessarily leads to low-frequency parasitics is not uncommon. However, t.g.t.p. oscillation requires that the plate circuit be tuned to a frequency higher than that of the grid circuit and this condition seldom prevails with values used in practice, so far as single-ended circuits are concerned.

Fig. 3-A shows a conventional arrangement with parallel feed throughout. For low frequencies the tank coils, L_1 and L_2, have negligible reactance and may be considered simply as long leads short-circuiting the tank condensers, C_1 and C_2. The circuit for low frequencies then becomes that shown in Fig. 3-B. Even if the by-pass condensers, C_6 and C_8, are small, or omitted entirely, the

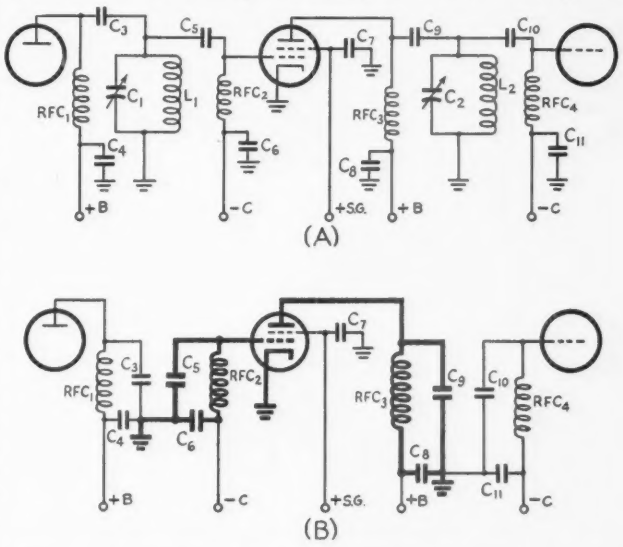


Fig. 3 — A — Conventional capacitance-coupled amplifier with parallel feed throughout. B — Possible low-frequency parasitic circuit in heavy lines. Values in this circuit seldom are appropriate for oscillation, however.

circuit still will be completed through power-supply filter condensers or a biasing battery, both of which have negligible reactance to low frequencies. The tanks then are composed essentially of the grid choke, RFC_2, tuned by the coupling condenser, C_5, and the plate choke, RFC_3, tuned by the blocking condenser, C_9. It will be noted that neither the plate choke of the preceding stage nor the grid choke of the following stage comes into the picture, because the only connection is the common ground or chassis connection.

In practice, the coupling condenser seldom exceeds 100 $\mu\mu$fd., while a 2.5-mh. r.f choke is used universally for RFC_2. This gives an LC product of 250. In the plate circuit, a blocking condenser of 1000 $\mu\mu$fd. (0.001 μfd.) is most often used and the plate choke is seldom less than 1 mh. in transmitters working no higher than 30 Mc. These values give an LC product of 1000. Thus, it is obvious that t.g.t.p. oscillation should not take place with ordinary values.

The situation changes considerably, however, when a conventional balanced circuit is used in either grid or plate with r.f. chokes in both. Fig. 4-A shows such a circuit with balanced output. Fig. 4-B shows the low-frequency circuit that lurks beneath the surface. This time, the tank coil, L_2,

serves not to short-circuit the tank condenser but, considerably worse, to connect the two sections in parallel across the plate r.f. choke. The difficulties are the same with either a single tube or two in push-pull.

The grid-circuit *LC* product, we have seen, is about 250 with usual values. The plate tank condenser seldom will exceed 100 $\mu\mu$fd. per section, or a total of 200 $\mu\mu$fd. maximum across RFC_2 which usually is 1 mh. Thus we see that even with the tank condenser at maximum capacitance, the *LC* product cannot exceed 200. A 2.5-mh. plate choke will bring the figure up to 500 *but only at maximum capacitance of the tank condenser.* At all settings below half capacitance, the plate circuit will be tuned to a frequency higher than that of the grid circuit. In fact, the plate choke can be increased to almost any size within practical limits without improving the situation materially, because the plate circuit always can be tuned to a frequency higher than that of the grid when the

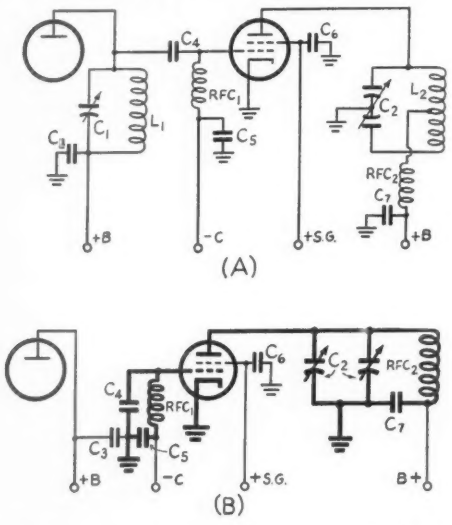


Fig. 4 — A — Conventional capacitance-coupled amplifier with balanced output circuit and parallel grid feed. B — Resulting low-frequency parasitic circuit in heavy lines.

tuning condenser is set at or near minimum.

The most obvious remedy is to eliminate at least one of the chokes. However, the grid choke cannot be replaced by a resistor without involving considerable loss in excitation. The plate circuit is series fed but the choke is necessary to break up any harmful resonances which may be set up in the individual tanks that are formed when the coil center-tap as well as the condenser rotor are grounded. A check also showed that the second-harmonic output increased with this connection. The condition was even worse with the condenser rotor floating. In considering the substitution of a resistor for the plate choke, it had been assumed that any value sufficiently high to isolate the center-tap would cause a greater voltage drop than could be afforded. However, this did not prove to be the case when it was tried. As little as 100 ohms could be used. This is fortunate because the low resistance substituted for RFC_2 in Fig. 4-B effectively shunts the grid choke of a following stage, which in this case *can* serve as the inductance tuned by C_2.

In link-coupled push-pull circuits, the grid choke, which is tuned by the sections of the grid tank condenser in parallel in the parasitic circuit, can be eliminated by the substitution of the grid-leak resistor, as shown in Fig. 5-A. With capacitance input coupling as shown in Fig. 5-B, however, the plate choke of a parallel-fed driver can serve as the parasitic grid inductance. The low-frequency circuit is shown in Fig. 5-C. Thus it is seen that R_1 must be of low value if oscillation is to be prevented. This can be accomplished by making R_1 100 ohms or so, by-passing the lower end to ground, and then adding grid-leak resistance or any other biasing system desired, as shown in Fig. 5-D. This permits the use of the series choke in the plate circuit or parallel plate feed if desired.

In searching for low-frequency parasitics, the tubes in the preceding and following stages should be removed as before. The wavemeter should be held close to the grid or plate r.f. choke.

Operating-Frequency Oscillation with Tetrodes

When the statement is made by the manufacturer that a beam tetrode does not require neutralization, tight shielding and the fact that a screen-grid tube should never be operated without load to prevent damage to the screen doubtless are taken for granted as a consideration. But there is some doubt as to whether or not it is safe to rely too heavily on normal loading as a dependable means of stabilization. A condition is frequently encountered in practice when an 807 will appear perfectly stable when running loaded with uninterrupted excitation and without modulation and yet will develop widespread clicks when the transmitter is keyed, or splatter when the amplifier is modulated. We have seen more than one commercial installation with heavy loading resistors across the tanks and they weren't put there to increase tank-circuit efficiency!

A check with an r.f. indicator will show that there is plenty of driver r.f. getting through to the plate tank circuit in any unneutralized 807 amplifier. Neutralizing shows that most of it is coming through the grid-plate capacitance, be it internal or external. Even though a tetrode may never be operated without load, it is pretty safe to say that if it is made stable without load, there will be little chance for trouble when load is applied. It isn't difficult to arrive at an arrangement of components which will permit the intro-

duction of simple homemade spaced-disk type neutralizing condensers. The ones we have used with 807s consist of a long flat-head machine screw with its head working against a stationary ½-inch disk. The leads to the condenser should be kept short, of course, so that they will not couple into other parts of the circuit.

The indicator part of the absorption wavemeter, that is, the crystal and by-passed milliammeter in series, makes a very sensitive neutralizing indicator. When building one of these wavemeters, it is a good idea to bring out terminals so that this portion of the instrument can be used separately. These terminals are simply connected to a link coupled to the output tank coil. Neither grid-current fluctuation nor a neon bulb is a satisfactory indicator for neutralizing tetrodes.

With the exciter running, but with the amplifier plate and screen voltages off, the neutralizing indicator normally will show considerable energy in the plate tank circuit when it is tuned to resonance. The neutralizing condenser should be adjusted to the point where the indicator reading dips to its lowest point. It should be possible to find a minimum with a rise on either side somewhere within the neutralizing-condenser range. The neutralizing condenser should be adjusted with a long rod of polystyrene, wood or bakelite, sharpened to a screwdriver edge at one end, so that hand capacitance will not complicate the adjustment. If the amplifier is push-pull, the two neutralizing condensers should be kept at equal settings. Adjustment of the neutralizing condenser will have some effect upon resonance, so the tank condenser should be readjusted for resonance after all but minor changes in neutralizing capacitance. The output circuit of single-tube amplifiers should be carefully balanced by connecting a condenser across the neutralizing-condenser end of the tank circuit to compensate for the tube output capacitance across the other end, as shown in Fig. 6, C_1.

Before neutralizing, a pair of 807s with which we were working would oscillate at the operating frequency on all bands unless some load was coupled to the amplifier. The load required to stabilize the amplifier at the higher frequencies was considerable — in spite of the fact that there was plenty of shielding between the input and output circuits. With neutralizing, all trace of feed-through of driver energy to the plate circuit disappeared at 80 meters, and the amplifier was perfectly stable with all load disconnected. However, although the amplifier did not oscillate at 40, the indicator showed some energy getting through to the plate circuit. It became so great at 20 and 10 that the amplifier oscillated readily on these two bands unless heavily loaded, and could not be neutralized out. This was finally eliminated as previously described, by removing the screen suppressor resistors. After reneutralizing, the amplifier became perfectly stable on all bands without load. There still remained some slight indication of energy in the plate circuit at 20 and 10, but the feed-back was insufficient to support oscillation. It was found that the amplifier required different neutralizing adjustments for the extremes of 80 and 10. This condition was improved considerably by returning the neutralizing condensers to the tank side of the grid

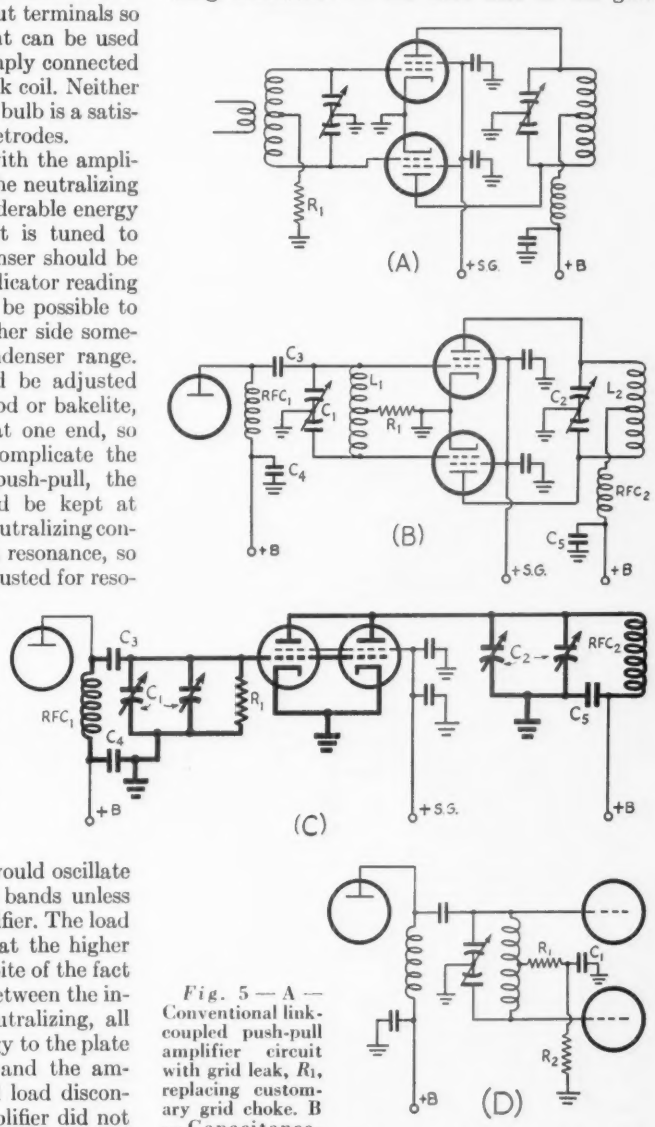


Fig. 5 — A — Conventional link-coupled push-pull amplifier circuit with grid leak, R_1, replacing customary grid choke. B — Capacitance-coupled push-pull input circuit with series grid feed and parallel driver plate feed. C — Low-frequency parasitic circuit resulting from arrangement of B. D — R_1, whose value is low, serves both to isolate the coil center-tap and load the low-frequency parasitic circuit. R_2 is the usual grid leak. C_1 should be not less than 0.01 μfd.

parasitic chokes as shown in Fig. 6, instead of directly to the grid terminals. No further improvement was found by tapping along the grid leads within the latitude permitted by the construction. When the amplifier was neutralized on 10, the adjustment held satisfactorily for the lower frequencies.

To some, the introduction of neutralization may be considered a complication which shouldn't be necessary with screen-grid tubes. However, a

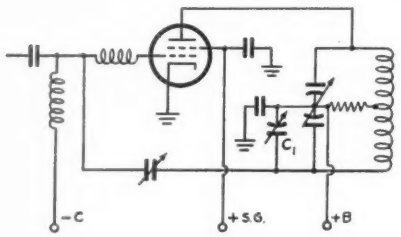


Fig. 6 — In neutralizing single-tube amplifiers, a balancing condenser, C_1, equal to the tube output capacitance, should be used.

push-pull stage, or one with balanced output, requires the addition of only the neutralizing condensers. A compensating fact is that tight shielding becomes unnecessary. In this particular instance, the feed-through of driver energy to the plate circuit actually decreased when shielding surrounding the lower portions of the push-pull tubes was removed. It was found that removing the shield from the grid coil, which was at right angles to the plate tank coil but not far from it, added nothing noticeable to the small amount of energy fed through after neutralization was completed.

Quite a bit has been said, from time to time, about the importance of avoiding long or common return paths for by-pass condensers in relation to stability. Such a thing is difficult to confirm in practice, especially when the amplifier is already stabilized. But we did move the grounding points for the screen by-passes around on the chassis within the radius of the condenser leads with no detectable change in operation. Using a 10-inch clip lead, the plate by-pass was grounded at points spread all over the chassis, top and bottom, with equally unimpressive results at a highest frequency of 30 Mc. Short returns discourage harmonics, however.

Balancing Push-Pull Drive

Before concluding, perhaps it is well worth while reminding those who build push-pull amplifiers of the importance of balancing the drive to the two tubes. This becomes even more important when using tubes like 807s, since underdriving of one tube can combine with the harmful effects of overdriving the other to give some pretty discouraging performance. In the capacitance-coupled push-pull amplifier with which we were working, provision for balance, as shown at C_1 in Fig. 7, was included. The output capacitance of the driver tube was looked up in the tube data and the balancing condenser, C_1, was set to what was estimated roughly by eye to be an equivalent capacitance. The amplifier performed very poorly. The output was considerably below the rated value and the dip in plate current at resonance was negligible when the amplifier was loaded to rated input. Finally, it was noticed that one plate was showing some coloring. A check of the individual screen currents (a convenient indication of balance in a push-pull amplifier, since the tank circuits don't have to be opened up for the meter) showed that one tube was drawing almost no screen current, while the screen current of the other was considerably in excess of its rating. It was found that a very careful adjustment was necessary to bring the two screen currents to the same value. The difference in performance after accurate balancing was remarkable. Good efficiency was obtained and off-resonance plate current increased to between 350 and 400 ma., giving a very pronounced dip to the rated 200 ma. at full rated load — and this with the screens supplied from a dropping resistor. Apparently, before balancing, one tube had been doing almost all of the work. With one tube loaded up to nearly 200 ma. it isn't surprising that the plate-current dip was negligible!

Let us repeat, too, another reminder. Hold the grid current of 807s and other beam tubes to the rated value at the recommended operating bias. Overdriving spoils the performance of tetrodes by running the screen current up unnecessarily. With a series resistor, this drives the screen voltage down, making it difficult to load the amplifier properly.

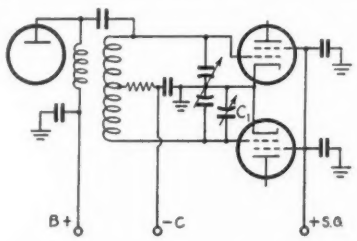


Fig. 7 — The excitation to push-pull tubes can be balanced by use of a balancing condenser, C_1, in the input circuit. Its value should be the same as the output capacitance of the driver tube.

Summary

The important points of the foregoing can be summarized by the following list of dos and don'ts:

1) Suppress v.h.f. parasitics with v.h.f. chokes in the grid and plate, following the dimensions

(*Continued on page 110*)

A Coaxial-Line Receiver for 220 and 235 Mc.

Making the Most of the Superregen on 1¼ Meters

BY C. VERNON CHAMBERS,* W1JEQ

• Tube for tube and dollar for dollar it's still pretty hard to beat the old superregen for v.h.f. applications. Here, through the use of a simple tuned r.f. stage and a coaxial-line detector circuit, the weaknesses of the superregenerative receiver are largely corrected. Sensitivity and selectivity are improved, and annoying detector radiation is held to a minimum.

TESTS made in the ARRL lab on the coaxial-line receiver recently described in *QST* by W1NXY[1] indicated performance so much better than other superregens on 144 Mc. that the possibilities of a similar technique for 220 and 235 Mc. were investigated. Though the conventional superregenerative circuits used for years on lower frequencies can be made to work on 235 or 220 Mc. with almost equal performance, their inherent weakness, broad tuning and severe radiation, make them of dubious value for use on any band where there is appreciable activity.

Just as was the case with the 144-Mc. job built by W1NXY, the 1¼-meter receiver built in the ARRL Lab shows improved selectivity, smoother performance, and lower radiation than are possible with the simpler types. The detector circuit is similar to the W1NXY receiver, except for the modifications required for the higher frequency. The r.f. stage differs, in that a 954 triode is used. This stage not only provides appreciable gain but, by reducing the effects of antenna resonance, it makes the tuning of the receiver and the setting of the regeneration control much less critical. It also prevents most of the radiation which would occur if the detector were coupled directly to the antenna. The r.f. circuits of the receiver can be made to cover both the 220- and 235-Mc. bands, or it can be made to tune either one of the bands with a considerable increase in bandspread.

Otherwise, the receiver is of the old rush-box variety. It still is the type of receiver that can be thrown together with the least amount of work and expense and, after the screwdriver and hack saw have been put away, it doesn't take an E.E. to make it behave properly.

Circuit Details

The circuit diagram of the receiver is shown in Fig. 1. The plate circuit of the r.f. amplifier employs a self-resonant loop, L_3, which is tuned to the middle of the operating range by the tube-and-circuit capacitance. A slight increase in receiver sensitivity can be obtained by tuning the plate circuit, but the small improvement does not appear to warrant the extra complications involved.

The detector is a 6AK5, with the concentric line connected in its grid circuit. In most respects it is similar to that of the W1NXY receiver, and the points made by Santangelo apply equally to this model, except that somewhat higher screen voltage may be needed for superregeneration at the higher frequency.

The audio output of the detector, which is fed through a quench filter consisting of C_9, C_{10}, C_{11} and RFC_1, is low, with the coupling arrangement shown, and this could be corrected (if a single audio stage is desired) by connecting the primary and secondary windings of the audio transformer in series, and using it as an audio choke. The

* Technical Assistant, *QST*.

[1] Santangelo, "Coaxial-Line V.H.F. Receivers," *QST*, March, 1948.

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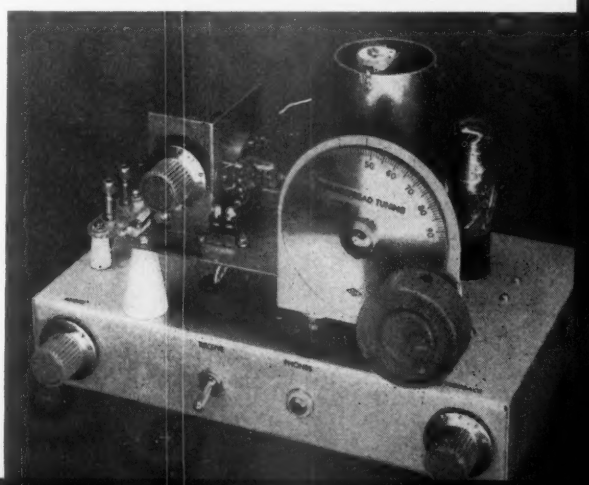

Front view of the coaxial-line receiver. The r.f.-amplifier tuning control is at the left and the main control, for the concentric-line detector circuit, is at the right side of the unit. The audio gain control, send-receive switch, 'phone jack, and regeneration control can be seen in that order, from left to right, across the front wall of the chassis.

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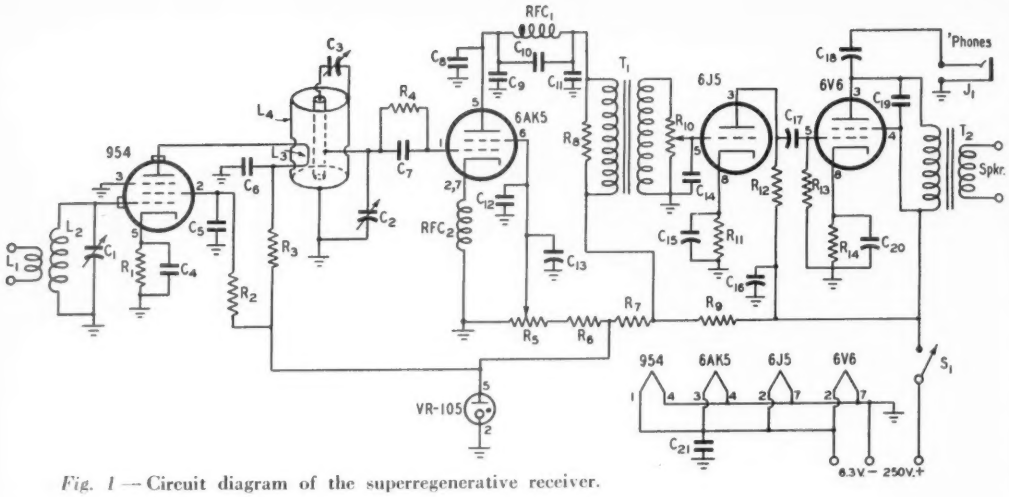


Fig. 1 — Circuit diagram of the superregenerative receiver.

C_1 — Midget variable condenser (Millen 20015 reduced to one stator and two rotor plates).
C_2 — Midget variable condenser (Millen 20015 reduced to one stator and one rotor plate).
C_3 — 5–20-$\mu\mu$fd. ceramic trimmer (Centralab 820-B).
C_4, C_5, C_6 — 100-$\mu\mu$fd. (National XLA-C).
C_7 — 22-$\mu\mu$fd. mica.
C_8, C_{12}, C_{21} — 470-$\mu\mu$fd. mica.
C_9 — 0.0022-μfd. mica.
C_{10}, C_{11} — 0.0068-μfd. mica.
C_{13} — 0.2-μfd. 400-volt paper.
C_{14} — 47-$\mu\mu$fd. mica.
C_{15} — 10-μfd. 25-volt electrolytic.
C_{16} — 8-μfd. 450-volt electrolytic.
C_{17}, C_{18} — 0.01-μfd. 400-volt paper.
C_{19} — 0.0047-μfd. mica.
C_{20} — 100-μfd. 25-volt electrolytic.
R_1, R_3 — 1000 ohms, ½ watt.
R_2 — 33,000 ohms, ½ watt.
R_4 — 0.1 megohm, ½ watt.
R_5 — 50,000-ohm potentiometer.
R_6 — 47,000 ohms, 1 watt.
R_7, R_9 — 1500 ohms, 10 watts.
R_8 — 22,000 ohms, ½ watt.
R_{10} — 0.25-megohm potentiometer.
R_{11} — 2200 ohms, ½ watt.
R_{12} — 0.1 megohm, ½ watt.
R_{13} — 0.47 megohm, ½ watt.
R_{14} — 270 ohms, 1 watt.
L_1 — 2 turns No. 18 e., ¼-inch inside diameter, close-wound.
L_2 — 2 turns No. 12 e., ¼-inch inside diameter, ⅛-inch space between turns.
L_3 — A 5¼-inch length No. 12 e., bent to form a U-shaped loop having a ¾-inch space between conductors. Plate side of loop is 1¾ inches long and the opposite side is 2¾ inches long.
L_4 — Concentric line. Inside conductor is a 4-inch length of ½-inch o.d. copper tubing. Grid tap 1 inch from grounded end for both 220- and 235-Mc. operation or ¾ inch from grounded end for 220 Mc. only. Outside conductor is a 4-inch length of 2-inch i.d. copper tubing.
J_1 — Open-circuit jack.
RFC_1 — 80-mh. choke (Meissner 19–5596).
RFC_2 — 1-mh. r.f. choke (National R-33).
S_1 — S.p.s.t. toggle switch.
T_1 — Interstage audio transformer (Stancor A-53C).
T_2 — Universal output transformer (Cinaudagraph U-85).

quality of the audio is good with the circuit shown in the schematic, however, and output, with the conventional two stages, is adequate for 'speaker operation. Resistor R_8, across the audio-transformer primary, helps to eliminate the howling which often develops in such receivers when the audio gain is advanced to the maximum position. Its value may require change for different audio transformers. The highest value which will eliminate the trouble should be used.

The audio section is similar to the W1NXY receiver, except for the addition of the decoupling condenser, C_{16} (which was found necessary in this model because of motor-boating), and the transfer of the 'phone jack from the first audio stage to the second. It is entirely possible that the decoupling condenser will not be necessary in a receiver of slightly different construction and it need not be hooked into the circuit unless trouble occurs.

The receiver is built on a standard aluminum chassis measuring 2 × 7 × 11 inches and the small panel for the detector tuning dial is cut from a sheet of 1/16-inch aluminum measuring 3⅞ × 3⅞ inches. The shelf for the r.f. section is made from a piece of 1/16-inch copper stock measuring 5½ × 6¼ inches which is cut and bent as shown in the photographs of the receiver. The horizontal section of the subchassis measures 3½ × 6¼ inches and the small vertical panel is 2 inches high and 2½ inches wide. The detector bandspread condenser and the aluminum panel for the detector tuning dial are both mounted on this upright member of the copper chassis. C_2 is mounted with the two stator terminals facing toward the right end of the chassis (as seen from the rear view) and the lower stator terminal is one inch up from the horizontal surface and 1¼ inch in from the left side of the copper panel. The tube socket for the 6AK5 is 2 inches in from the left end of the chassis and is located as far toward the front edge as possible.

The L-shaped bracket for the r.f. amplifier is 2½ inches high, has a depth of 2⅜ inches, and is 1½ inches across the front. Spade lugs are bolted, and then soldered, to the bottom of the partition to provide a method of mounting that is both electrically and mechanically sound. The National XLA tube socket is centered on the side of the partition at a point located 1⅜ inches in from the rear and top edges. A 5/16-inch hole, drilled in the bracket at this point, allows the grid prong of the 954 to extend through to the grid-circuit components. The cathode and heater prongs of the socket face toward the front of the receiver and the XLA-C by-pass condensers are mounted inside the socket. The plate by-pass condenser, C_6, is mounted underneath socket prong No. 5 as this prong is used as the support point for the cold end of the plate loop, L_3. Note that the No. 5 prong is a spare as far as the 954 is concerned. A National XLA-S internal shield, designed for use with the XLA socket, provides a common path for the condenser ground connections and, of course, this soldering should be done before the socket is bolted to the copper partition. The heater, cathode, and suppressor connections are also made to the internal shield and, after mounting, the shield is in turn soldered to the copper plate.

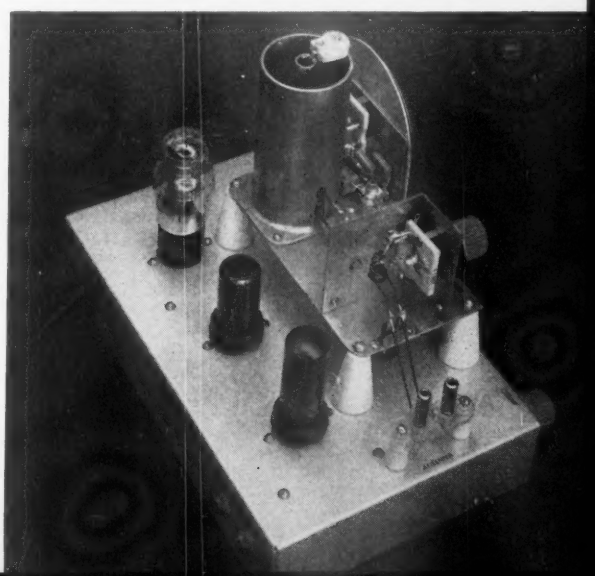
The r.f.-amplifier tuning condenser is mounted with the shaft in line with the shaft of C_2. Stator terminals face to the left so that the bottom terminal is within a ¼ inch of the 954 grid prong. L_2 is supported by the condenser terminals and the antenna coil, L_1, is supported by L_2 and by the two-terminal lug strip located to the right of the amplifier. Grid clips for the 954 were improvised by removing the prongs from a miniature tube socket.

Holes, large enough to clear 8/32 machine screws, are drilled at each corner of the copper mounting plate so that the unit may be mounted on 1½-inch stand-off insulators. Larger holes, equipped with rubber grommets, are adjacent to the detector and amplifier tube sockets so that power wiring may be passed down through the main chassis.

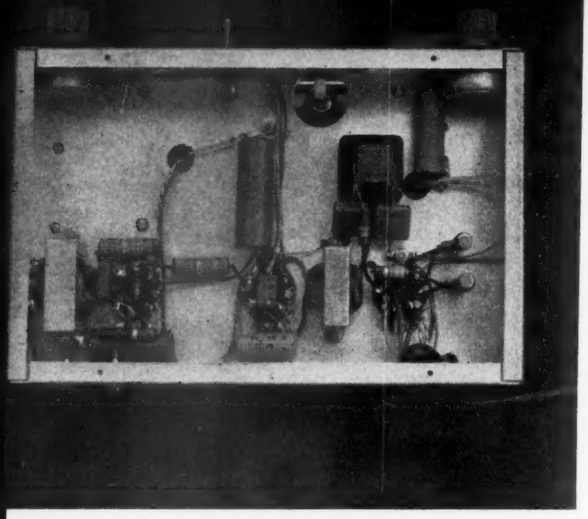
Construction of the concentric line is not difficult if the various operations are carried out as suggested below. The inner and outer conductors are 4 inches long, and the end plate is 2½ inches square. A ½-inch hole for the inner conductor of the line should be drilled at the center of the end plate, and the plate should also have a hole for a 6/32 machine screw at each corner. However, before the center hole is drilled, it is advisable to use the center-punch mark as the pivot for scribing a circle to indicate the position of the outside conductor. This will simplify the task of lining up the two pipes for the soldering operation.

A ⅜-inch hole should now be drilled in the large pipe at a point located 1 inch up from the bottom edge, and a second hole of 5/16-inch diameter should be drilled on line with the larger hole and around the pipe by 90 degrees. After the material between these two holes and the bottom of the tubing is removed by cutting with a hack saw, the finished slots will provide openings for the input coupling coil, L_3, and the detector-grid connection. The inner conductor should also be drilled and tapped for a 6/32 machine screw at this time. One hole, ¾ inch up from the bottom of the line, is required if the receiver is to be used to cover only one band. A second hole, ¼ inch above the first, is necessary if the receiver is to be tuned to both the 220- and 235-Mc. bands. In either case, the tapped hole will be used as the connecting point for the lead running to the tuning condenser, C_2.

Unless extremely thin-walled tubing is used for the concentric line, it will be difficult to complete the soldering operation with an ordinary iron. Placing the assembly on an electric hot plate will heat the copper in a very few minutes and will allow the work to be done neatly and easily. The end plate should be laid on a flat level surface while the inner conductor is lined up perpendicular to the horizontal surface of the plate. This operation may be carried out with the metal



Rear view of the superregenerative receiver. The r.f. circuits are mounted on a copper shelf to the left of the antenna terminals. The detector tuning condensor is mounted on a small panel to the front of the coaxial line, and the band-set condenser is soldered across the open end of the line. The r.f. stage is mounted on an L-shaped bracket with the tube socket and plate-circuit components on the left side and the grid circuit on the right side. Audio tubes and voltage regulator are in line across the rear of the chassis.



Bottom view of the coaxial-line receiver showing the output transformer, T_2, located at the lower left-hand corner of the chassis, and the audio transformer, T_1, mounted between the sockets for the audio tubes. The quench-filter choke, housed in a metal shield, is above and to the right of T_1. Resistors R_7 and R_9 are mounted on end to the right of the regulator-tube socket.

resting on the hot plate if the latter is to be used. The outer conductor should be placed in the position indicated by the scribed circle. Heat may now be applied and the soldering completed. The metal is ready to accept solder when a rapid change in the color of the copper is noticed. A long piece of solder may be inserted through the open end of the line, and as the end is moved around the surfaces to be joined the solder will melt and run into place easily.

The remaining constructional work is straightforward and study of the three photographs will show the location of the various components. Since there is no crowding of parts, it should not be difficult to duplicate the original layout.

Testing

Operation of the receiver is similar to that of lower-frequency types and the tuned circuits should be lined up by means of a signal generator or by listening to amateur signals of known frequency. A power supply capable of delivering 250 volts at 40 or 50 ma., and 6.3 volts a.c. at 1 ampere, should be used. It will be especially helpful if the test signal can be set at the center of the band, or bands as the case may be. The first indication of proper operation will be the usual superregenerative hiss heard after power has been applied and the superregeneration control advanced in a clockwise direction. The tuning controls, C_1 and C_2, should now be adjusted so that their plates are half-meshed, and the input signal should be coupled to the receiver. C_3, the band-set condenser, is now adjusted for maximum receiver response to the test signal. The grid coil of the r.f. amplifier may be slightly off resonance at the beginning of the test and this is corrected by increasing or decreasing the length of the winding.

The procedure outlined above is also used when the test signal is located near the edge of the band. However, the tuning condensers are first adjusted to either maximum or minimum capacitance, depending upon whether the test signal is at the high or the low end of the band. Of course, if the set is being lined up for two-band operation, it is necessary to set the tuning condensers well toward minimum or maximum capacitance depending on which of the two bands is being tackled first.

The bandspread of the detector circuit can be adjusted to allow a full band to occupy approximately 60 divisions of the main dial, this being obtained with the 6AK5 grid tapped up ¾ inch from the grounded end of the line. If it is necessary to change the tap to alter bandspread, it is advisable to readjust the band-set condenser, and to realign the r.f. stage.

The setting of the regeneration control, after alignment of the receiver, is important, and it should be adjusted to permit maximum receiver sensitivity. It will not require readjustment over the band, except perhaps to accommodate different types of signals.

The input circuit of the receiver is intended for operation with a 300-ohm line. However, it can be used with a low-impedance line, and if single-wire feed or coaxial line is employed, one end of the coupling coil, L_1, should be grounded.

Strays

Having trouble getting your underground antenna to perk? Don't fume and exhume, OM! Instead, take W5NIY's suggestion and string a half-wave counterpoise 30 to 40 feet in the air. Bernie guarantees that this will end your troubles.

—···—

QST is interested in keeping a running file on the users of single-sideband suppressed-carrier transmission who are springing up all over the country. Anyone who has not done so is cordially invited to write and tell us of his activity. Please address your correspondence to ARRL, West Hartford, Conn., attention of Assistant Technical Editor Byron Goodman, W1DX.

Happenings of the Month

BOARD HIGHLIGHTS

In a packed two-day-and-night session with every director present, the ARRL Board of Directors at its annual meeting in early May decided to ask FCC to expand the 75-meter 'phone allocation to 3800–4000 kc. The question of 7-Mc. 'phone was carefully examined but overwhelmingly defeated. Sentiment was divided on expanding 14-Mc. 'phone but after a long and detailed discussion it was decided that our best interests were served by leaving the band as it is. The Commission is requested to make n.f.m. 'phone permanent in the lowest 50 kc. of the 75- and 20-meter subassignments. Changes were asked in the 50-Mc. band to make the first 100 kilocycles (to 50.1 Mc.) exclusively c.w.; to permit n.f.m. 'phone wherever A3 is used (above 50.1); and to permit AØ duplex above 51 Mc. To give the Class A examination new meaning, FCC is asked to add to it a code examination at 16 w.p.m. in addition to the special theory exam. In a far-sweeping decision of fundamental importance, FCC is asked to deny a new licensee, during his first year, the right to operate 'phone on frequencies below 30 Mc. That request would deny future amateurs the present right to begin 'phone operation immediately on the 10- and 11-meter bands but would give them c.w. rights on every amateur frequency and 'phone rights above 50 Mc. The Board decided against asking FCC for a compulsory regulation to limit 'phone sidebands but strongly urged members operating below 14.4 Mc. to take immediate steps to reduce sideband components more than 3000 cycles from the carrier frequency by at least 20 db. A proposal to extend high-stability requirements to the 2-meter band was studied but it was decided that the time for this had not yet arrived.

There was a careful review of organizational matters, with a considerable emphasis on subjects relating to emergency communication. Funds were provided for the travel of Section Emergency Coördinators within their sections in promoting and coördinating this work, and provisions were continued for the travel of SCMs and QSL Managers to near-by conventions. The QSL Managers got a thumping vote of thanks for their hard work. Proposals for extensive reorganization of the manner of conducting Board meetings and of the organization of the Executive Committee and of Headquarters were rejected but a constitutional amendment was adopted to permit holding special Board meetings at the call of a majority of the directors. League advertising policies were reviewed and reaffirmed. The proposal to reapportion ARRL divisions to coincide with FCC call areas was again examined and again rejected. Special elections were ordered held when there is a vacancy in the office of alternate director. The Canal Zone was incorporated in the Southeastern Division.

The position of the amateur institution in respect of its frequencies and its relations with the Government and the public was carefully examined. Plans were made for participation and representation at the coming Inter-American conference at Bogotá, where regional frequencies will be allocated to services. Secretary Warner and Assistant Secretary Budlong were commended for their achievements on behalf of amateur radio at the recent Atlantic City conference.

In a review of League finances it was found that the expenses for the desired promotional and organizational activities and services to members were exceeding expected revenues, because of constantly increasing costs. To maintain to the fullest possible extent the quality and scope of the League's services to amateurs, membership dues were increased, effective July 1st, to $4.00 in the United States, $4.50 in Canada.

Two important new committees were set up. One is to study all possible means of increasing the efficiency of amateur self-policing within our bands and to make recommendations to the Board for action. The other is a Building Committee of five directors under the chairmanship of Vice-President McCargar to study the desirability of acquiring a permanent Headquarters building and its most desirable location. They are also to study the suitability of W1AW to its tasks and the feasibility of moving or supplementing its facilities. They are to make recommendations for desirable actions by the Board, with detailed plans, before the next annual meeting.

The by-laws governing eligibility of directors to serve on the Board were amended to deny eligibility to managers of broadcasting stations. In respect of Director Richelieu, however, who recently so changed his occupation, the Board unanimously agreed that he was eligible under the wording of the by-laws as they existed at the time of his election, and that it was proper for him to serve out the remainder of his term.

President Bailey and Vice-President McCargar were unanimously reëlected for two-year terms.

By special arrangement in our Production Department to hold this page well past the usual deadline, we have been able to get the foregoing account of the "high spots" into this issue of *QST*. Next month we'll give you the complete minutes to serve as a detailed blow-by-blow account of an historic meeting, and the background and details of the Board's decisions will be reported and made clearer in our next few issues.

NEW FREQUENCY REGS

At the special request of ARRL, FCC on April 28th, in time for our Spring V.H.F. QSO Party, shifted our temporary band at 235–240 Mc. to its permanent location at 220–225 Mc., effective immediately. The old band may also be used through June 8th but thereafter everybody has to move to the new figures.

Users of this band will remember that there is a treaty arrangement between the U.S. and some British countries concerning possible use of DME in the range 220–231 at certain aviation gateways and along the Canadian border. Should interference to DME occur, FCC will designate areas within which the amateur band will temporarily revert to 235–240 Mc. for the remainder of the treaty period — until the end of 1951 — and so our old band is being held in reserve for that purpose in case of need. We accordingly advise you to hold on to any 235–240 apparatus that is not being converted to the new band, altho no QRM cases are expected to occur.

Also on April 28th, effective at once, FCC expanded our 1215–1295 Mc. band to 1215–1300, per Atlantic City, and simultaneously withdrew the right to use pulsed emissions on this band as previously mentioned.

There is some confusion in our regulations where our frequencies and types of emission are still stated in prewar terms, with a footnote making our actual authorizations dependent upon an FCC order in the 130 series — of which there have been about 17 since V-J Day. To clear up this confusion FCC on April 28th did an editorial job on our regulations by issuing a long order that repealed Order 130-P and incorporated all our present provisions into our standing regulations. The only changes in our operating authorizations are those concerning the 220- and 1215-Mc. bands reported separately above, but you should be familiar with all the provisions of the new order. Here they are:

Amendments to Part 12 of the Commission's Rules Governing Amateur Radio Service are as follows:

1. Footnote "3" keyed to the subtitle "Allocation of Frequencies" which immediately precedes §12.111 is amended to read as follows:

> The assignment and use of all frequencies below 25 megacycles contained in these regulations are subject to change in accordance with the Commission's final report of allocations below 25 megacycles, in Docket Proceeding No. 6651.

2. §12.111 is amended to read as follows:

§12.111 *Frequencies and types of emission for use of amateur stations.* (a) Subject to the limitations and restrictions set forth herein and in §12.114 of these rules, the following frequency bands and types of emissions are allocated and available for amateur station operation as follows:

(1) 1750 to 2050 kc. Not available for use.

(2) 3500 to 4000 kc. Use of this band is restricted to amateur radio stations as follows:

(i) 3500 to 4000 kc, using type A1 emission, to those stations located within the continental limits of the United States, the Territories of Alaska and Hawaii, Puerto Rico, the Virgin Islands and all United States possessions lying west of the Territory of Hawaii to 170° west longitude.

(ii) 3850 to 4000 kc, using type A3 emission, to those stations located within the continental limits of the United States, the Territories of Alaska and Hawaii, Puerto Rico, the Virgin Islands and all United States possessions lying west of the Territory of Hawaii to 170° west longitude, subject to the further restriction that type A3 emission may be used only by an amateur station which is licensed to an amateur operator holding Class A privileges and then only when operated and controlled by an amateur operator holding Class A privileges.

(3) 7000 to 7300 kc, using type A1 emission.

(4) 14000 to 14400 kc, using type A1 emission, and, on frequencies 14200 to 14300 kc, type A3 emission, subject to the restriction that type A3 emission may be used only by an amateur station which is licensed to an amateur operator holding Class A privileges and then only when operated and controlled by an amateur operator holding Class A privileges.

(5) 27.160 to 27.430 Mc, using types AØ, A1, A2, A3, and A4 emission and also special emission for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques), subject to such interference as may result from the emissions of industrial, scientific and medical devices within 160 kc of the frequencies 27.120 and 27.320 Mc.

(6) 28.0 to 29.7 Mc, using type A1 emission, and on frequencies 28.5 to 29.7 Mc, using type A3 emission, and on frequencies 29.0 to 29.7 Mc, using special emission for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques).

(7) 50.0 to 54.0 Mc, using types A1, A2, A3, and A4 emission and, on frequencies 52.5 to 54.0 Mc, special emission for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques).

(8) 144 to 148 Mc, using types AØ, A1, A2, A3, and A4 emission, and special emission for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques).

(9) 220–225 Mc, using types AØ, A1, A2, A3, and A4 emission, and special emission for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques), provided that until January 1, 1952, if this band is required for distance measuring equipment at certain United States gateways and Canadian border locations, amateurs within interference range of those gateways and locations shall, after publication by the Commission of an order designating the areas involved, cease to use this band, but shall be entitled in lieu thereof to use the band 235–240 Mc.

(10) 235 to 240 Mc, using types AØ, A1, A2, A3, and A4 emission, and special emission for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques) until January 1, 1952, provided that commencing with June 9, 1948, this band may be used only as a substitute for the band 220–225 Mc in those cases in which the band 220–225 Mc may not be used, as provided in (9), above, of this section.

(11) 420–450 Mc, using types AØ, A1, A2, A3, A4, and A5 emission, and special emissions for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques). Peak antenna power shall not exceed 50 watts in order to minimize interference to aircraft altimeters temporarily allocated to this band.

(12) 1215 to 1300 Mc using types AØ, A1, A2, A3, A4, and A5 emission and special emission for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques).

(13) 2300 to 2450 Mc, 3300 to 3500 Mc, 5650 to 5925 Mc, 10,000 to 10,500 Mc, 21,000 to 22,000 Mc, and any frequency or frequencies above 30,000 Mc, using on these

frequencies types AØ, A1, A2, A3, A4, and A5 emission and special emission for frequency modulation (radiotelephone transmissions and radiotelegraph transmissions employing carrier shift or other frequency modulation techniques), and pulse emission. Operations in the frequency bands 2300 to 2450 Mc and 5650 to 5925 Mc are subject to such interference between 2400 and 2450 Mc and between 5775 and 5925 Mc, respectively, as may result from emissions of industrial, scientific and medical devices on the frequencies 2450 and 5850 Mc, respectively.

3. §12.112 is deleted.

4. §12.114 is amended to read as follows:

§12.114 *Types of emission.* (a) Type AØ emission, where not specifically designated in the bands listed in §12.111 of these rules, may be used for short periods of time when required for authorized remote control purposes or for experimental purposes. However, these limitations do not apply where type AØ emission is specifically designated.

(b) Narrow-band frequency or phase modulation may be used, in addition to the types of emission specifically designated in §12.111 of these rules, by certain amateur stations for radiotelephone communication until further order of the Commission, but in no event beyond August 1, 1948, as follows:

(1) Amateur stations licensed to and operated by Class A amateur operators in the frequency bands 3850 to 3900 kc and 14200 to 14250 kc; and

(2) Amateur stations licensed to and operated by all classes of amateur operators in the frequency bands 28.5 to 29.0 Mc and 51.0 to 52.5 Mc and all frequency bands where "special emissions for frequency modulation" (wide-band FM) are presently authorized.

(c) The authorization provided by (b), above, is subject to the conditions that the band-width of the modulated carrier shall not exceed the band-width occupied by an amplitude-modulated carrier of the same audio characteristics, and that the purity and stability of such emissions shall be maintained in accordance with the requirements of §12.133 of the Commission's Rules Governing Amateur Radio Service.

5. §§12.115, 12.116 and 12.117 are deleted.

WASHINGTON NOTES

Committees have been organized and preparatory work has begun at Washington to get ready for the next Inter-American Regional Radio Conference, now planned to be held at Bogotá, Colombia, next March. In addition to writing a new regional convention the conference will deal with all of the aspects of the regulations, including frequencies, that were left on a regional basis by the recent world conference at Atlantic City. ARRL is of course participating.

The ARRL request of FCC for permission to operate mobile on all amateur frequencies experienced delay until the end of the ACy conference and from some further complexities that required study of notification procedures. The general outlook is now favorable, however, and we hope that we may have some definite good word on the subject in another month or so.

A clarification of the amateur regulations prohibiting broadcasting but authorizing certain desirable types of one-way transmissions is now on the way through the FCC machinery and is expected to be effective some time in June or July. ARRL has represented amateurs in discussions of the subject with FCC personnel and we may feel that the changes to be made protect our interests and are for the good of our service. Details when we have them.

If you haven't a postwar license, don't forget your 1948 renewal. See data in this department in recent *QST*s.

WANTED: RADIOMEN FOR OVERSEAS

A department of the United States Government has need for civilian radio operators and operator-technicians for interesting overseas duty. Men with qualifying experience will be selected to operate and maintain radiotelegraph stations in various parts of the world, qualifying and operating under federal regulations.

The work has particular appeal to radio amateurs, often calling for the special sort of ingenuity with which hams are endowed. The pay is good, ranging from $2644.80 for communications technicians to $4149.60 for senior supervisors. In those places where the living costs exceed the current cost of living in the United States, an allowance is paid, designed to meet this differential. There is opportunity for further promotion within the organization to grades paying considerably higher salaries. Transportation, in accordance with U. S. Government travel regulations, is furnished to and from the overseas duty station. It is expected that living quarters and transportation for families will be available at a few locations. Men employed for this work will be sent, whenever possible, to a country of their choice. The minimum period of overseas service is twenty-four months.

Requirements range upward from the minimum for communications technicians, a code speed of 18 five-letter random groups per minute, one year's experience in professional, military, or amateur radio, and ability to handle simple maintenance. At the top of the list is senior supervisor, for which applicant must hold, have held, or be able to qualify for, a radiotelegraph 1st- or 2nd-class or radiotelephone 1st-class license; and he must hold, have held, or be able to qualify for, an amateur radio ticket; must be thoroughly familiar with maintenance of communications-type receivers and able to design and construct c.w. transmitters of medium power. He also must be familiar with common models of commercial and military equipment and be well versed in radio propagation, including ability to make practical use of Bureau of Standards publications on that subject. Code-speed requirement is 25 five-letter random code groups per minute (typewriter). He must be able to supervise a large radio station (up to 30 positions). Ratings in between communications technician and senior supervisor require a proportionate amount of experience and operating ability. Any trained radioman should be able to qualify quite easily for one of these ratings, particularly if he has had recent military communications experience.

Qualified operator-technicians who are interested in these positions should write letters

RESULTS OF GENERAL AMATEUR POLL NO. 3

PROPOSAL NO. 1 — Shall the U. S. assignment 3850–4000 kc. be changed to 3800–4000 kc.?

PROPOSAL NO. 2 — Shall the 7-Mc. band remain exclusively c.w. telegraphy?

PROPOSAL NO. 3 — Shall the U. S. assignment 14,200–14,300 kc. be changed to 14,200–14,400 kc. until the effective date of the Atlantic City allocations, thereafter to be 14,200–14,350 kc.?

	PROPOSAL NO. 1						PROPOSAL NO. 2						PROPOSAL NO. 3						
	YES		NO		BLANK		YES		NO		BLANK		YES		NO		BLANK		TOTAL
Division	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number=100%
Atlantic	1,214	70.6	498	28.9	8	0.5	1,207	70.2	510	29.6	3	0.2	1,234	71.7	471	27.4	15	0.9	1,720
Central	1,061	74.1	366	25.5	5	0.4	988	69.0	441	30.8	3	0.2	1,126	78.6	290	20.3	16	1.1	1,432
Dakota	237	72.9	87	26.8	1	0.3	242	74.5	83	25.5	0	0.0	255	78.5	67	20.6	3	0.9	325
Delta	355	78.2	95	20.9	4	0.9	312	68.7	138	30.4	4	0.9	358	78.8	91	20.0	5	1.2	454
Great Lakes	926	72.0	353	27.5	6	0.5	881	68.6	400	31.1	4	0.3	994	77.3	281	21.9	10	0.8	1,285
Hudson	1,076	73.3	385	26.1	9	0.6	1,062	72.2	407	27.7	1	0.1	1,067	72.6	392	26.6	11	0.8	1,470
Midwest	738	80.6	173	18.9	5	0.5	593	64.8	321	35.0	2	0.2	733	80.0	172	18.8	11	1.2	916
New England	730	64.5	398	35.1	4	0.5	818	72.2	310	27.3	4	0.5	787	69.5	333	29.4	12	1.1	1,132
Northwestern	646	78.4	170	20.6	8	1.0	534	64.8	289	35.1	1	0.1	657	79.6	153	18.6	14	1.7	824
Pacific	661	80.8	154	18.8	3	0.4	589	72.0	225	27.5	4	0.5	608	74.3	201	24.6	9	1.1	818
Roanoke	366	67.7	175	32.3	0	0.0	385	71.2	156	28.8	0	0.0	376	69.6	159	29.3	6	1.1	541
Rocky Mountain	177	80.4	39	17.7	4	1.9	165	75.0	54	24.5	1	0.5	173	78.6	44	20.0	3	1.4	220
Southeastern	404	74.0	137	25.1	5	0.9	375	68.7	171	31.3	0	0.0	423	77.5	116	21.2	7	1.3	546
Southwestern	868	85.1	144	14.1	8	0.8	690	67.6	325	31.9	5	0.5	831	81.5	177	17.3	12	1.2	1,020
West Gulf	669	84.1	122	15.3	5	0.6	515	64.8	276	34.6	5	0.6	675	84.8	120	15.1	1	0.1	796
TOTALS	10,128	75.0	3,296	24.5	75	0.5	9,356	69.3	4,106	30.4	37	0.3	10,297	76.2	3,067	22.7	135	1.1	13,499

setting forth qualifications, particularly with respect to the following:

1) Radio operating and technical experience, including military
2) Present code speed
3) Present license(s) and length of time held
4) Part of the world in which duty is desired
5) Part of the world in which duty is not desired
6) Age and marital status, including number of children, if any
7) Specialized training, e.g., teletype maintenance, etc.

Letters should be addressed to: Box 73, % Administrative Headquarters, The American Radio Relay League, West Hartford 7, Conn. If you have previously written an application for one of these openings, it will not be necessary to write again as your original letter is still on file.

POLL RESULTS

An article in February *QST*, entitled "Shall 'Phone Frequencies Be Increased?," published at the instructions of the ARRL Board of Directors, presented three proposals originated by the Board's Planning Committee and solicited an expression of opinion thereon from all interested U. S. licensed amateurs for the information of the Board. The poll closed March 31st and the responses were then tabulated for the consideration of the directors in their examination of this matter at their meeting in May.

A total of 13,499 licensed U. S. amateurs responded. The answers have been sorted by ARRL divisions in the U. S. and the figures are presented in the accompanying table for the general information of the membership.

NATIONAL CONVENTION

We urge you to make your plans now to attend the big ARRL National Convention at Milwaukee over the Labor Day week-end, September 4th-5th-6th. It will be the best convention in amateur radio in the past ten years. See the earlier announcement in this department in April and May *QST*. For reservations and further information, write the general convention chairman, Jack Doyle, W9GPI, 4331 No. Wildwood Ave., Milwaukee 11, Wisconsin.

FCCommissioner George E. Sterling, W3DF, now "The Honorable," will bring the convention a message from the Commission about the amateur service. Also from FCC as guests of the Milwaukee Radio Amateurs' Club will be George K. ("Red") Rollins, W3GA, chief of the Radio Operator & Amateur Division, and one of his section chiefs, Robert W. Percy, W4IQR, chief of the Amateur Radio Service Section. Between them they will be able to tell us about the FCC administration of amateur radio and answer the many questions that can be expected from the several thousand hams in attendance.

12th ARRL Field Day Coming Up

Individuals, Groups and Clubs Preparing for Annual Test on June 12th–13th

BY F. E. HANDY,* WIBDI

THE Annual ARRL Field Day combines the many joys of operating ham radio afield with the more serious business of putting amateur emergency stand-by gear to test. United States and Canadian amateurs are again invited to participate in this annual battle with the elements, which this year is expected to set new records for scores and number of communities represented on the air. Naturally, emphasis is placed on portable operation, but for those home stations that engage in working the more rugged brethren afield, special listings crediting participation will be published in *QST*.

Whether your emergency gear is a lone crystal-controlled oscillator run from an auto battery and dynamotor or a community affair with gas-driven generator, be sure to give it a FD workout. After all, the fellow who sets up his apparatus and makes only one contact gains in experience, points and preparedness over the amateur who doesn't turn out. Advance reports have it that many of the large clubs have made elaborate preparations for this year's fray; however, in the planning of this contest no opportunity for making participation attractive even to one- and two-person entries has been overlooked. Will you be in there helping your local EC put your home-town on the amateur emergency communications map?

In preparing for Field Day, be sure to select a site away from any fixed-station location. Make certain, also, that you file advance notice with FCC of your intention to operate portable at this location. Since every emergency-minded group will have precut antennas on hand, the installation of antennas should be a routine task. However, antennas used in the FD must be those put up especially for the test or antennas maintained exclusively for community emergency-preparedness purposes — never any fixed station's skywire.

It is hoped that FD participation will encourage the maintaining in reserve of more easily-transported handle-equipped rigs, capable of providing several hours of dependable service from an ordinary car battery. Such lightweight equipment is inexpensive, easy to service, and a welcome companion for vacations or long trips.

A preliminary discussion of the FD rules was given on page 62 of April *QST*. The operating period is 4 P.M. Saturday, June 12th to 4 P.M. Sunday, June 13th, *your local standard time.* One point per QSO will be allowed for working either home stations or other portables. Each complete transmitter-receiver-antenna-power-supply set-up, where more than one operate simultaneously under one FCC notification, contributes its points to the group score. The points for each QSO depend on the power level and the source of power (battery, generator, commercial mains). Messages originated for FD credit must contain the information required by Rule 5 and must be addressed to the SCM or SEC of the ARRL section in which the FD activity takes place.

Field Day Rules in Detail

1) An individual equipment or units placed under one call and in control of one licensee — one who has made the required advance notification meeting government requirements and who is responsible for the accuracy of all logs and records — may constitute a score group for entry. Field Day is a test of portables; mobile work does not count. "Manufactured" contacts arranged with other stations do not count. FCC §12.92 requires one notice to the Engineer-in-Charge of the FCC district in which portable operation will take place.[1] Give (a) station call, (b) name of licensee, (c) date or dates of proposed operation, and (d) location of field-portable.

2) All control locations for equipment operating under one call and responsibility-to-FCC must be within 500 feet of a given spot for the points to count toward one score.

3) *Bands:* The following 13 bands (and additional u.h.f.-s.h.f. bands if you choose) constitute separate bands on which simultaneous operation may be arranged, if desired: *A1* — 3500–4000, 7000–7300, 14,000–14,400, 27,160–27,430, 28,000–29,700 kc.; 50–54 and 144–148 Mc. *A3* — 3850–4000 kc.; 14.2–14.3, 28.5–29.7, 27.16–27.43, 50–54 and 144–148 Mc. (In Canada VE 'phone bands apply.)

One transmitter may be changed from band to band at will for a one-transmitter-class entry. The number of units in simultaneous operation *at any*

* Communications Mgr., ARRL.

[1] Amendment of the Rules Governing Amateur Radio Service about May 20th is expected to authorize both portable and mobile amateur operation within the continental limits of the United States on *any* frequency authorized and available for the amateur service, and at the same time to remove the requirement for prior written notice to the Engineer-in-Charge if such operation is for a period of less than 48 hours. Watch W1AW bulletins for early information on this which may eliminate the need for filing FCC notice for Field Day plans as required by current regulations.

one time determines the class of the entry. *It is regarded as improper and grounds for disqualification to use more than one transmitter at one time in the same band, such as one on 3510 and 3700 kc., or 14.1 and 14.35 Mc., for example.* (This is not construed to bar the use of two transmitters, one on 75 'phone and one on 80 c.w., or one on 7-Mc. and one on 3.5-Mc. c.w. at the same time, etc., for a multitransmitter-class entry. There is no distinction between a.m., f.m., and n.f.m. for FD purposes. Eleven meters will be regarded as one band when using voice, another when using c.w., as distinct from similar ten-meter considerations.)

V.h.f.-*only* scores (for work on and above 50 Mc.) will be grouped under one heading in the compilation of results.

4) *Scoring:* Each amateur station worked by a Field Day station counts 1 point. *The same station contacted again counts only if the FD transmitter credit reported is on a different amateur frequency band as above defined.* (In the case of home stations, 1 point is credited for each FD portable worked.)

5) *Message Credits:* Field Day messages to your SEC or SCM (addresses on page 6) will include the number of operators, the field location and the number of AEC members in each operating group. One such message originated at a Field Day station will count 25 points before multiplier, subject to deduction of *ten* points for omission of handling data and *ten* points for defects in form. To claim credit, message copy must be submitted with the worked list by bands showing time of each contact. Relays: 2 added points before multipler (1 for receiving, 1 for sending on) may be claimed by FD handling stations. Delivery to addressee is of course required on all FD messages in transit at the end of the test as prerequisite to credit. (Home Stations: 1 point may be claimed for each special FD message received and mailed to SCM or SEC with copy to Headquarters. Similarly claim 2 points for FD-message relays, one when received and one when forwarded by radio.)

6) *Multipliers:* Powers up to and including 30 watts input to the final take a multiplier of 3 for the points earned. Power limits between 30 and 100 watts, inclusive, similarly take a multiplier of 2 for the points earned when so operating.

Independence-of-Mains Multiplier: Multiply points by 3 when operating with *all* radio equipment independent of commercial power source.

Battery-Credit Multiplier: The points made for each contact with transmitter-receiver *completely battery-powered* are subject to an additional multiplier of 1.5. Charging batteries from commercial mains while they are connected to the transmitter or receiver voids the independence-from-mains multiplier.

About charging batteries *while in use:* It is permissible to charge from car generator or gas-power, but if this is accomplished from commercial mains this voids the three multiplier for "independent power source" for points made while so operating. "In use" is defined as with battery connected to transmitter or receiver. You can charge batteries *not in use* from power lines between periods of transmission or reception.

For stations in the Northwestern, Pacific, Rocky Mt., Southwestern, and West Gulf Divisions, scores may be multiplied by 1.5.

Home-station score is the sum of contact points plus message credits — Rules 4 and 5. No multipliers are allowed.

A staff Contest Committee will have the final word on adjudication of scores and rulings on any special problems. Field Day results will be reported with club entries classified by the number of transmitter set-ups operated at any one time and with credits for nonclub entries as a separate listing. The summary of points for contacting stations will have all message credits added *before* multipliers. For example: Let's assume that a 25-watt rig wholly on batteries contacts 40 stations, not originating or relaying any messages.

40 points (40 stations)
× 3 (power below 30 watts)
120
× 3 (power independent of mains)
360
×1.5 (everything on batteries)
540 claimed score

(If the required message origination is duly sent and receipted for and reported we then have
25+40=65 × 9 × 1.5 = 877.5 score)

7) *Hours:* Twelfth ARRL FD starts at 4 P.M. local *standard* time, Saturday, June 12th, and ends at 4 P.M. local *standard* time, Sunday, June 13th.

Mail individual and group reports, eliminating duplicate contacts, to Headquarters, on or before July 9th. Show contact time, band used — attach traffic for claims. Show *handling* data, power input, and power sources. Request mimeographed ARRL forms or make up your own giving the information required by these rules.

COMING CONVENTIONS

June 5th–6th — Atlantic Division, Washington, D. C.
Aug. 21st–22nd — West Gulf Division, Houston
Sept. 4th–5th–6th — NATIONAL CONVENTION, Milwaukee
Sept. 19th — New Hampshire State, Concord
Oct. 2nd–3rd — Hudson Division, Albany
Oct. 2nd–3rd — Southwestern Division, Los Angeles
Oct. 8th–9th — Eastern Canada, Montreal
Oct. 16th–17th — Midwest Division, Wichita

I.A.R.U. News

DA CALLS NOT AUTHORIZED

In recent weeks, there has appeared on the amateur bands a number of stations signing calls with the prefix DA. The Office of Military Government (U. S.) in Germany advises that no DA prefixes are legally authorized for use in that country and that action is being taken to identify and apprehend the operators involved, all of whom are believed to be German nationals.

At the present time, we are informed, only the following call assignments are authorized in Germany: United States Zone, D4AAA through D4ZZZ; British Zone, D2AA through D2ZZ; and a limited number in the French Zone from the block D5AA to D5ZZ. All assignments are restricted to personnel under military control of the individual zones. So far, although representations for restoration of amateur privileges have been made by German amateur radio organizations, it has not been found in the interests of the Allied governments to permit amateur activity on the part of German citizens.

The spirit of amateur radio does not recognize geographical boundaries, nor does it engage in differences arising from opposing ideologies, political or otherwise. Being truly internationally-democratic, it transcends all of those things; an amateur is judged by his fellow hams only by the technical excellence of his signal and the quality of his operating. Those of us who are privileged to engage in amateur radio can view with sympathy the plight of those less fortunate who, although still carrying the spark of the amateur spirit and fired with enthusiasm and yearning for the privileges of better days, find themselves denied amateur radio.

Nonetheless, the inescapable facts are that the aforementioned DAs are unauthorized in a country with which there are as yet no peace treaties; and that the existing Allied military governments in Germany, because basically they look with favor upon amateur radio, can in no sense be deemed guilty of suppressing amateur radio in toto. In view of these facts, the Headquarters feels obliged to announce that, for the time being, it cannot handle QSLs either for or from unauthorized operators in Germany, nor otherwise sanction their illegal operation. The control of bona fide amateur radio in occupied Germany will be greatly facilitated if amateurs in other countries would refrain from engaging in communications with these unauthorized stations.

SWITZERLAND

The *Union Schweiz Kurzwellen Amateure*, being desirous of maintaining healthy emulation among its members and of strengthening bonds with foreign amateurs, has initiated a new operating award entitled "Helvetia 22." An appropriate certificate will be awarded to each European amateur, Swiss or otherwise, who submits proof of having established two-way radiotelegraphic contacts on each of two different bands with amateur stations located in each of the 22 cantons of Switzerland, and to each amateur outside Europe who similarly proves contact with one station in each of the 22 cantons.

Each QSL submitted as proof must show the abbreviation of the name of the canton, per the following: 1, Zurich, ZH; 2, Berne, BE; 3, Lucerne, LU; 4, Uri, UR; 5, Schwyz, SZ; 6, Unterwald, NW; 7, Glaris, GL; 8, Zoug, ZG; 9, Fribourg, FR; 10, Soleure, SO; 11, Bale, BS; 12, Schaffhouse, SH; 13, Appenzell, AR; 14, St. Gall, SG; 15, Grisons, GR; 16, Argovie, AG; 17, Thurgovie, TG; 18, Tessin, TI; 19, Vaud, VE; 20, Valais, VS; 21, Neuchatel, NE; 22, Geneve, GE.

Contacts must have been made subsequent to 0001 GCT, April 15, 1948. Applications, with supporting proofs, should be addressed to Inter-

(*Continued on page 110*)

When you hear a signal from Macau with a feminine lilt, it's Teresa Rosario, 2nd op. at CR9AN. Teresa, better known as Tereng and no relation to the station licensee, is a top-notch operator with a beautiful fist, according to the lucky lads who have QSOed her. Tereng copies the fast stuff without batting an eyelash — and does it longhand, too. She is shown here during one of her infrequent moments away from CR9AN as the "headliner" of ceremonies in connection with the inauguration of the Hong Kong-Macau radiotelephone service.

A New Approach to Single Sideband

Generating S.S.S.C. by the "Phasing" Method

BY DONALD E. NORGAARD,* W2KUJ

• Here is an outline, with some practical pointers, of a method for generating a single-sideband suppressed-carrier signal without the need for a sharp filter and multiple heterodyning. The complete practicability of the system has been proved by almost two years of laboratory and on-the-air testing by the author. It is a significant step in taking s.s.s.c. out of the luxury class and placing it within the reach of every amateur.

THE *QST* article [1] describing a single-sideband exciter operating on the principle of filtering out the undesired sideband undoubtedly has left many an amateur wondering if all single-sideband equipment is necessarily complicated. The filter principle is effective, of course, but it leads to over-all complexity of a transmitter and requires very careful design, construction and adjustment. In fact, to set up such a transmitter and make it work properly is a task that requires considerable technical skill and meticulous attention to detail. The few who have done this job well deserve to be complimented.

On the other hand, the advantages of s.s.s.c. over a.m. are too great to be passed over by any amateur looking for something better in 'phone technique. Some of these advantages have been described in previous articles in *QST*, and Table I shows a comparison of some of the features. These points were discussed in detail last month.[2]

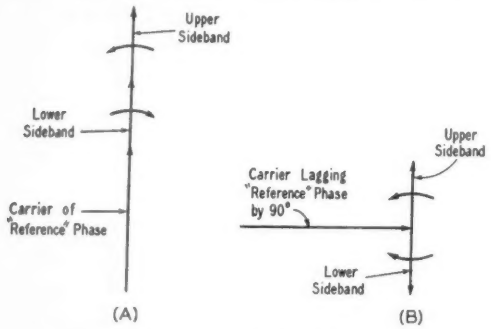


Fig. 1 — **The carrier and sideband relationship required to generate a single-sideband signal by the "phasing" or "balancing" method. The modulating signal in B leads the modulating signal in A by 90°. When the two signals represented by A and B are combined, the upper sidebands add and the lower sidebands cancel out, resulting in a single-sideband signal.**

S.S.S.C. by "Phasing"

Fortunately for the rest of us, another method of generating single-sideband signals has been developed to a degree that many of the problems associated with the filter method are eliminated, and better performance can be obtained at much lower cost. Fundamentally, the method consists of removing one of the sidebands by means of a balancing process rather than by filtering.

The principle employed may be explained by reference to Figs. 1-A and 1-B, which are vector diagrams showing the relationship between carrier and sidebands produced in amplitude modulation. In Fig. 1-A a carrier is shown in "reference" phase, and the positions of the sideband vectors indicate that peak-envelope conditions exist at the instant shown. In Fig. 1-B a carrier of the same frequency but 90° away from that of Fig. 1-A is shown. The two sideband vectors in Fig. 1-B indicate that the envelope has a value (at the instant shown) equal to the carrier; that is, the modulating signal is 90° away from that which gave the conditions shown in Fig. 1-A.[3]

If the conditions shown in Fig. 1-A exist at the output of one modulating device at the same instant that the conditions indicated in Fig. 1-B exist at the output of another modulating device, and if the sideband frequencies and magnitudes are the same, the simple sum of Figs. 1-A and 1-B will consist of carrier and upper sideband only. It can be seen that the lower-sideband vectors are equal in magnitude and opposite in direction, and hence would cancel one another. How can this result be obtained in practice?

The vector diagram of Fig. 1-A might be said to represent the output of a modulated amplifier where a carrier of reference phase is modulated by a tone of reference phase. Thus, Fig. 1-B would represent the output of a second modulated amplifier where a carrier of the same frequency but 90° displaced from reference phase is modulated by a tone that is also 90° displaced from its reference phase. To make the whole thing work, the frequencies of all corresponding signals

* Research Laboratory, General Electric Co., Schenectady, N. Y.

[1] A. H. Nichols, "A Single-Sideband Transmitter for Amateur Operation," *QST*, January, 1948.

[2] D. E. Norgaard, "What About Single Sideband?" *QST*, May, 1948.

[3] For interpretation of these vector diagrams, see *QST* for May, 1948, page 14.

represented in the two vector diagrams must be exactly the same. This would suggest an arrangement such as Fig. 2, which would operate satisfactorily if the 90° phase-shift devices held amplitudes and phases of the respective signals to agree with the requirements indicated in Figs. 1-A and 1-B. The carrier phase-shifter is easy to build, since the carrier frequency is constant, but the modulating signal phase-shifter might not be, since it must work over a wide range of frequencies. To build such a phase-shifter has been so difficult a problem that people have been forced into the alternative measure of using filters to attenuate an undesired sideband. The arrangement of Fig. 2 works in principle but not in practice, for any wide range of modulating frequencies.

It so happens that two phase-shift networks having a *differential* phase shift of 90° can be inserted between the source of modulating signals and the modulating devices to generate sets of sidebands which can be combined to cancel one of the sidebands as indicated earlier. This leads to an arrangement such as that shown in Fig. 3, where the symbols "α" and "β" indicate the two networks that have a *difference* in phase shift of 90° over any desired range of modulating signal frequency. The principle of Fig. 3 has been found to be practical for several important reasons:

1) A carrier of any desired frequency can be used. This means that heterodyning the output to a higher frequency is not at all necessary as is the case when a filter is used to eliminate one sideband.

2) Conventional parts may be used in any and all of the circuits. There is no "problem of the filter." The cost, therefore, is low.

3) Any desired range of modulating frequencies may be employed. There is no theoretical limit to how low or how high these frequencies may be, but, of course, there are practical limits. The phase-shift networks to be described will cover a frequency range of 7 octaves, far more than is necessary for speech. This range may be extended by appropriate extension of the network design.

TABLE I

A Comparison of A.M. and S.S.S.C.

	Amplitude Modulation		*S.S.S.C.*	
	Transmitter (% of Peak)	*Receiver (% of Peak)*	*Transmitter (% of Peak)*	*Receiver (% of Peak)*
Peak Power Output	100	100	100	100
Carrier Power Output	25	25	0	supplied by receiver
Carrier Voltage	50	50	0	
Total Peak Sideband Power	12 5	12 5	100	100
Bandwidth (% of audio spectrum)	200	200	100	100
"Communication Efficiency"*	12 5	—	100	—
Practical "Communication Efficiency"**	10 (max.)	—	70	—
System Gain* (Decibels)	0 (reference)		plus 9	

* Based on output power.
** Based on input power.

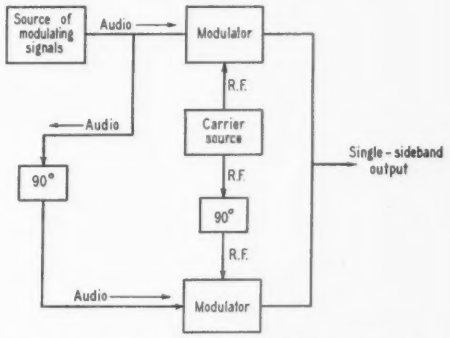


Fig. 2 — **A block diagram showing the circuits required to generate a single sideband by the method of Fig. 1. This is an impractical method because there is no known means for obtaining the 90° audio shift over a wide range of frequencies.**

4) Modulation may be accomplished at any chosen power level. In the interest of efficiency, it is generally wise to carry out this portion of the process at receiver-tube level, using linear amplifiers to build up the power.

5) Simple switching may be provided so that amplitude-modulation, phase-modulation or single-sideband signals may be generated.

The only critical portions of the arrangement of Fig. 3 are the phase-shift networks. Enough design work has been done on these so that simple and practical equipment can be built. Adjustment procedures are straightforward and simple, too. Fig. 4 is a circuit diagram of a complete α or β phase-shift network, the difference between the two networks being in the constants R_1, C_1, R_2, C_2, etc. Values for these constants are given in Table II. It should be pointed out that the plate and cathode resistors for each tube section must be carefully matched to within 1% of one another, and that the plate power supply have very low internal impedance. An electronically-regulated supply is perhaps the most practical means of satisfying this latter requirement.

The characteristics of the phase-shift networks are shown in Fig. 5. It can be seen that the differential phase shift averages 90° over a fre-

TABLE II

Values for Use with Fig. 4

Symbol	*∝ Network*	*β Network*	*Remarks*
R_1	51,000 ohms	0.10 megohm	Adjust *RC* product to 12.30 microsec. for ∝, 51.20 microsec. for β. Tolerance: ± ½%.
C_1	241 μμfd.	512 μμfd.	
R_2	0.10 megohm	0.56 megohm	Adjust *RC* product to 148.5 microsec. for ∝, 420.0 microsec. for β. Tolerance: ± ½%.
C_2	1485 μμfd.	750 μμfd.	
R_3	0.56 megohm	0.56 megohm	Adjust *RC* product to 1230 microsec. for ∝, 5120 microsec. for β, Tolerance: ± ½%.
C_3	2200 μμfd.	9140 μμfd.	
R_{10}	2.2 megohm	2.2 megohm	Input circuit may be omitted if driving circuit supplies grid return.
C_{10}	0.05 μfd.	0.05 μfd.	
$R_{11a, b}$	1000 ohms	1000 ohms	Resistors *a* and *b* in each section should be matched to within ± ½%.
$R_{12a, b}$	2000 ohms	2000 ohms	
$R_{13a, b}$	3000 ohms	3000 ohms	
$R_{14a, b}$	4000 ohms	4000 ohms	10% tolerance suitable.

B + = 300 volts. All resistors are ½-watt composition. For sake of stability R_1, R_2, R_3, R_{11}, R_{12}, R_{13} and R_{14} should be high-quality resistors. Continental "Nobleloy" Type X-½ resistors are recommended. C_1, C_2 and C_3 should be made up of fixed mica and compression padders in parallel to permit adjustment of *RC* products to agree with close tolerances in "Remarks" column.

Tubes used: two 6SL7GT double triodes for each network.

Maximum signal input: 2 volts peak-to-peak.

Insertion loss: approx. 8 db. for each network.

quency range of at least 7 octaves, or from 60 to 7000 c.p.s., for the constants given. Of course, the ideal differential phase shift is exactly 90°, and the excursions of the actual phase-shift curve are ± 2° from this value. The ratio of undesired sideband to desired sideband is dependent upon this deviation, the most unfavorable points being at the peaks and valleys of the differential-phase-shift curve. The ratio

$$\frac{\textit{undesired sideband}}{\textit{desired sideband}} = \tan\left(\frac{\delta}{2}\right),$$

and for $\delta = 2°$,

$$= \tan\left(\frac{2°}{2}\right) = 0.0174, \text{ or } -35 \text{ db.}$$

The symbol δ represents the deviation of the actual performance from the ideal 90°, and, in the above example, δ was taken at its maximum value. The average attenuation of the undesired sideband is more than 40 db. over the band of modulating frequencies between 60 and 7000 c.p.s. There is little to be gained by improvement of this ratio, since subsequent amplifier distortions can introduce the unwanted sideband in sufficient amounts to mask any improvement gained by idealizing the phase-shift network characteristics.

A Practical Exciter Circuit

While the block diagram of Fig. 3 is useful in explaining the principle of generating single-sideband signals, it does not represent a complete single-sideband exciter with enough gadgets to satisfy a person with a practical turn of mind. There is little to be gained by using single sideband unless the carrier is attenuated, but Figs. 1-A, 1-B, and 3 do not indicate this. Therefore, Fig. 6 is offered as a workable system that provides for carrier attenuation, amplitude modulation, phase modulation, single sideband, operation on 75- or 20-meter 'phone, and QSY within these bands. If multiband operation is not desired and if QSY [4] is not deemed necessary, modulation can be accomplished at the operating frequency by appropriate simplification of the arrangement of Fig. 6.

It is not the purpose of this article to give specific circuit-design data for a complete single-sideband exciter; rather, the purpose is to point out the over-all features that *must* be observed in order to satisfy the requirements of this system of generating single-sideband signals. For instance, the design of the bandpass circuits indicated in Fig. 6 is beyond the scope of this article. The advantage of using such an arrangement designed to cover the amateur band in use is that no tuning adjustments whatsoever need be made when it is desired to QSY. With ordinary circuits, best operation usually demands retuning when

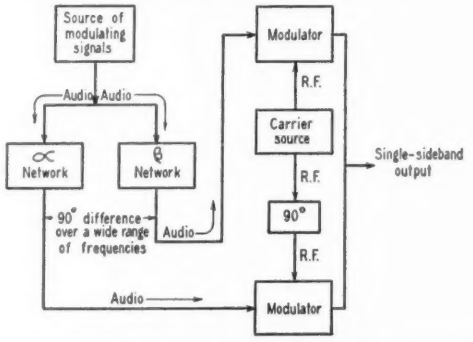


Fig. 3 — The system outlined in Fig. 2 becomes practical by using two audio channels (∝ and β networks) with a constant phase *difference* of 90°.

large percentage changes in frequency are made. However, ordinary tuned circuits can be substituted for the bandpass transformers, as in any transmitter.

A conservative output rating for an 807 output stage would be 30 watts peak, under drive conditions where the grid takes no current (Class AB_1). This will compare in sideband power to an a.m. signal of 60 watts carrier output. If suitable bias

[4] By "QSY" is meant any change in frequency, whether obtained in discreet steps (by switching crystals, for example) or continuously-variable frequency control by means of a VFO.

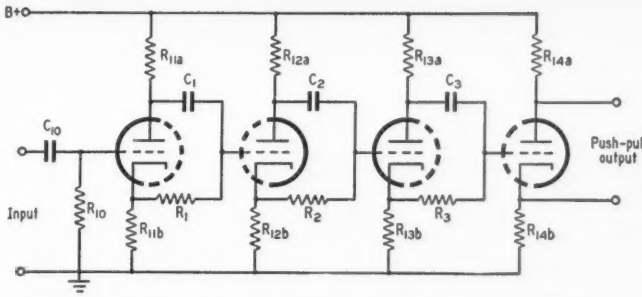


Fig. 4 — A typical 3-element ∝ or β phase-shift network. Values are given in detail in Table II.

and drive are supplied to the 807, a conservative 50 watts peak output may be obtained. This, of course, is the power equivalent of 100 watts carrier output of an a.m. signal. In either case, the output power is sufficient to drive additional amplifiers of fairly-sizable ratings or to use directly as a low-power single-sideband 'phone transmitter. In comparison, only 15 watts [5] of carrier output can be obtained when using a.m., or 40 watts [5] with phase modulation.

It is usually practical to build the voice-frequency equipment (the a.f. amplifiers and the phase-shift networks) on one panel, and the modulators, converter (if used), and amplifiers including the 807 output stage on another. The dashed line in Fig. 6 indicates such a division and gives us a chance to consider these portions separately. The functional block diagram (Fig. 6) might appear formidable at first glance, but the whole arrangement lends itself to rather simple circuit design. Separate consideration of the two portions of Fig. 6 should not be taken to indicate independence of one from the other. It is well to keep in mind that in this system the audio-frequency circuits and the radio-frequency circuits must work hand-in-hand in order to generate single-sideband signals of superior quality.

Notes on the Audio System

The audio-amplifier and phase-shift circuits are straightforward. The important consideration is that the phase-shift and amplitude relationships determined by the phase-shift circuits must be preserved over the entire voice range in succeeding parts of the system. Fortunately, there is nothing difficult about it, once the objectives are clearly in mind. These objectives are:

1) Low harmonic distortion and noise.
2) Vanishingly small discrepancies in phase-shift and amplitude response.
3) Ease of control and adjustment.
4) Simplicity and low cost.
5) Stability of characteristics.

[5] RCA ratings for this class of service.

Most microphones in current amateur use require low-level amplification (the usual microphone preamplifier) to bring their output signals up to, say, a level of one or two volts. This is the job required of the audio amplifier ahead of the ∝ and β phase-shift networks. (See Fig. 6.)

This is as good a time as any to mention the desirability of including in the "preamp" a bandpass or low-pass audio filter to pass the important speech band out to 3000 cycles or so, to conserve space on the bands. The operation of the rest of the circuits in the system in no way requires this, but good sportsmanship in the use of our bands does. It is good practice to eliminate unnecessary low frequencies, too, concentrating on the portion of the audio spectrum between 200 and 3000 c.p.s. for maximum intelligibility. Numerous articles [6] have been written on the subject, and suitable bandpass-filter designs are available for this purpose. Why do anything about it at all, if the system as such does not require it? The answer has two important aspects — important to *you* as an occupant of the bands we share:

1) Intelligible speech does not require transmission of frequencies higher than 3000 c.p.s. To do so adds practically nothing to intelligibility

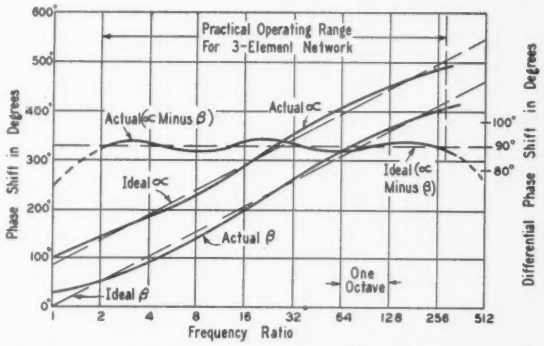


Fig. 5 — This plot shows how the 90° difference between the ∝ and β networks is maintained over a wide frequency range. The scale for the phase difference is given on the right-hand side of the graph.

but does increase the space in the band required for transmission. It boils down to the fact that we want the "other fellow" to use as little of our bands as possible, and the Golden Rule certainly does apply in this matter. In addition, regardless of how "high fidelity"-minded one may be,

[6] W. W. Smith, "Premodulation Speech Clipping and Filtering," *QST*, February, 1946; J. W. Smith and N. H. Hale, "Let's Not Overmodulate," *QST*, November, 1946; W. W. Smith, "More on Speech Clipping," *QST*, March, 1947; Galin, "Audio Filters for the Speech Amplifier," *QST*, November, 1947.

crowded bands force the operator who listens to the transmission to restrict his receiver bandwidth so much that he receives only what is necessary, if even that much. Not only is "high fidelity" wasted, but also its use is downright selfish.

2) Elimination of frequencies below 200 c.p.s. removes a large percentage of the high-energy speech components that do not contribute to intelligibility. Such elimination permits the transmitter to concentrate its efforts on only the *essential* portions of speech power. In practice, this means something like 3 to 6 db. in system effectiveness. Remember how we gained 9 db. by eliminating the carrier (corresponding to zero modulation frequency) and one sideband,[2] on the basis that these components were not essential? Two or three dollars spent on a suitable audio filter (and that's all one should cost) can give a transmitter a communication effectiveness equivalent to doubling or quadrupling its output power. It's worth it!

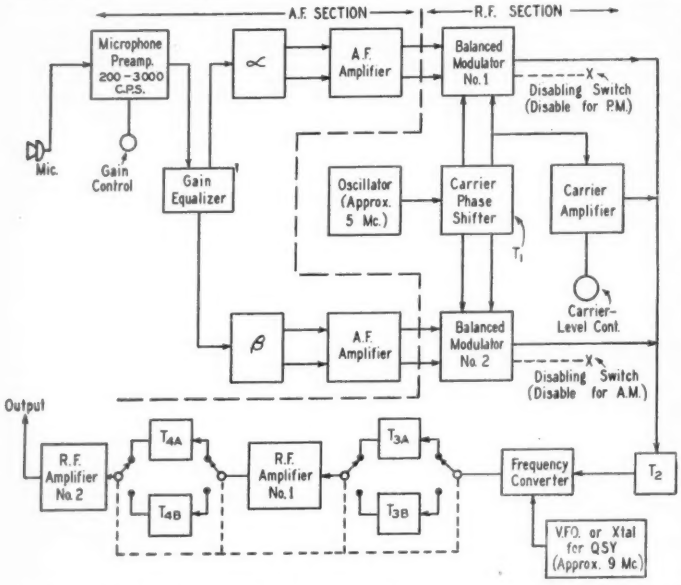


Fig. 6 — **Block diagram of an exciter capable of generating s.s.s.c., a.m. and p.m. signals on either the 75- or 20-meter bands. Table III gives a description of the various components.**

Notes on the R.F. System

Considerable flexibility is possible in the design of the radio-frequency portion of the block diagram in Fig. 6. The objectives in this portion of the single-sideband system are:

1) Very high order of frequency stability.

2) Provision for 90° r.f. phase shift in the excitation for the two balanced modulators.

3) Ease and stability of adjustment.

4) Absence of r.f. feed-back.

5) Low distortion in modulation and subsequent amplification.

6) Provision for adjustable carrier level; generation of a.m., p.m., and single-sideband signals; output-level control.

7) (optional features) Operation on 75- or 20-meter bands; easy QSY within each band; choice of sideband transmitted.

Obviously, a number of methods exist for accomplishing these objectives. Many of the possible methods that may occur to the designer will satisfy the requirements quite well; some will not. Others, while technically adequate, may be difficult to adjust or may be impractical in some other way. Since the handling of radio frequencies is concerned in this portion, good mechanical layout and construction is of considerable importance. Also, since stability of adjustment is one of the principal objectives, it is a good idea to provide some sort of locking arrangement for the balance controls to prevent accidental shifting of their positions.

Balanced Modulators

Fig. 6 indicates the use of two balanced modulators. The balanced modulator is not a new idea — in fact it is one of the oldest modulation schemes in existence — but such a thing is not often employed in amateur practice. A little explanation might be helpful in understanding why and how balanced modulators are used.

In amplitude modulation the maximum strength of any sideband that can be produced is one-half the strength of the carrier.[2] Since the carrier must be present in order to be modulated, but is not needed afterward (in single-sideband transmission, that is) it can be balanced out. This, then, is one job that the balanced modulator is called upon to do — namely, to permit sidebands to be generated, but to balance out the carrier after it has served its purpose. There are many forms of balanced modulators; some balance out one or the other of the two signals supplied; others can balance out both input signals. But none of them can balance out *one* sideband and not the other. Nature itself seems to be quite positive about that. But while balanced modulators may be new to amateur radio, there is nothing difficult about their construction and adjustment.

Since the signal that is to be balanced out is an alternating-current wave, it is necessary in the process to take account of phase relationships as well as magnitudes. Unless the two signals which are to be balanced have a phase difference of exactly 180°, perfect balance cannot be obtained

by any amount of adjustment of amplitudes alone. This, incidentally, may explain why trouble is sometimes encountered in neutralizing an amplifier, since the same principle is involved. In the case of the balanced modulator, the perfection of balance required is usually quite high, and some means for satisfying the conditions necessary for balance must be provided. Very few arrangements automatically provide the conditions necessary for perfect balance and frequently those that do are limited to operation at low frequencies, where circuit strays have negligible effect. It has been found practical to "grab the bull by the horns" and use some arrangement where separate phase- and amplitude-balance adjustments are provided, rather than to hope for a fortuitous set of conditions that might permit balance.

The circuit shown in Fig. 7 illustrates this philosophy. Fundamentally, only one of the tubes need be supplied with modulating signal, two tubes being necessary only to allow balance of the undesired component (the carrier) in the output. If, however, each tube is made to generate sidebands as well as to balance the carrier from the other, the ratio of residual unbalanced carrier signal to desired output is made smaller at low cost. Likewise, even small amounts of the modulation defect known as carrier shift are effectively reduced. The carrier signals at points *A* and *B* in Fig. 7 are made as nearly equal in magnitude and opposite in phase as is feasible using circuit components of ordinary commercial tolerances. The *RC* circuit between point *A* and grid No. 1 of the first modulator tube (a 6SA7 converter tube in this example) may be designed to provide about 20° phase shift at the operating frequency, by suitable choice of R_a and C_a. The *RC* circuit in the other grid can be designed to produce variable phase shift from 10° to 30°, by adjustment of the trimmer capacity, C_b. This permits a phase correction of ±10° — usually sufficient to insure perfect phase balance of the signals applied to the tubes. No attempt is made to equalize the magnitudes of the signals in the grid circuits because it is almost too much to expect that a perfectly-balanced pair of tubes could be found in order to take advantage of balanced amplitudes. Instead, the function of amplitude balance is accomplished by means of a bias adjustment on one of the tubes of the pair, so that the carrier signals are balanced out in the plate circuit of the tubes. That, incidentally, is what must happen anyway, regardless of the method used. The picture is completed by applying push-pull modulating signals to the No. 3 grids so that the sidebands produced by the separate modulation processes in each tube add together in the common plate circuit. The audio-frequency component balances out in the plate and screen circuits, this being a case of a balanced modulator that balances against each of the input signals. However, slight unbalance of the audio-frequency signals does absolutely no harm in the particular application of this circuit, so no provision is made for balance adjustment at low audio frequencies.

In any balanced modulator the efficiency is necessarily low, since at least one of the input signals is dissipated in the modulating elements

TABLE III

Explanation of Fig. 6

Microphone preamplifier	Sufficient gain to bring microphone output to a voltage level of approx. 2 volts, peak-to-peak.
α, β	Phase-shift networks in accordance with Fig. 4. Two 6SL7GT tubes.
A.F. amplifier	Push-pull self-balancing amplifier with good phase and amplitude characteristics. Maximum output required approx. 2 volts, peak-to-peak.
Balanced Modulators 1 and 2	Two 6SA7 tubes (in each). See Fig. 7 for details.
Carrier phase-shifter, T_1	5-Mc. double-tuned transformer with push-pull output from each winding at low impedance. Output on each line 2 volts, peak-to-peak.
Carrier amplifier	6SJ7 tube.
T_2	5-Mc. double-tuned transformer.
Disabling switches	Bias controls for No. 3 grids of modulators. Can be ganged to permit s.s.s.c.-a.m.-p.m.
Carrier-level control	Bias control on grid No. 1 of carrier amplifier. Minus 10 volts to minus 3 volts range.
T_{3a}, T_{4a}	Bandpass double-tuned transformers to cover 75-meter 'phone band.
T_{3b}, T_{4b}	Bandpass double-tuned transformers to cover 20-meter 'phone band.
Frequency converter	6SA7 converter tube.
R.F. amplifier No. 1	6AK6 miniature beam tube. Operates as Class A amplifier.
R.F. amplifier No. 2	807 beam-power output tube. Can be operated as Class A or B amplifier.

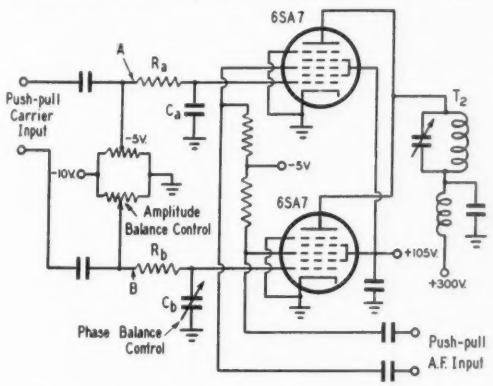


Fig. 7 — A typical balanced modulator, using 6SA7 tubes. Provision is included for obtaining amplitude and phase balance of the r.f. (carrier) input.

or associated circuits. In the case of a balanced modulator that suppresses the carrier, the efficiency cannot possibly be greater than 50%. The efficiency obtained in practice is more like 5% to 10%. Where two balanced modulators are used (as in Fig. 6) the efficiency is still lower, since the unwanted sideband is dissipated. This situation leads to the choice of generating a single-sideband signal at very low power level where the inescapably low efficiency in the generation of the signal wastes no large amounts of power.

Good operating characteristics are obtained with 6SA7 tubes in this application when the No. 1 and No. 3 grids are supplied with maximum signals of about 1 to 2 volts peak-to-peak, at a bias of about 5 volts, negative. Other voltages are the same as recommended for converter service.

As in the case of the audio system, the radio-frequency circuits can employ receiving tubes of extremely modest ratings up to the point in the system where the signal levels reach the power-tube class. For instance, the r.f. portion of Fig. 6 up to the grid circuit of the output stage would somewhat resemble in over-all magnitude and construction the i.f. portion of an average communication receiver. The versatility of Fig. 6 should make it attractive, although some of this versatility is obtained at the expense of circuit complication not fundamentally a part of single-sideband operation. This is apparent when comparing Fig. 6 with Fig. 3.

Suppressed Carrier

The block diagram (Fig. 6) includes a carrier amplifier and carrier-level control for several good reasons. A really obvious one is that a.m. and p.m. signals *must* have a carrier, but the balanced modulators provide sidebands without carrier to the remainder of the system. In the case of a.m. or p.m. operation, the carrier amplifier supplies carrier of "reference" level to "hang the sidebands on." Although previous articles in *QST* [1,2,7,8] have emphasized that a carrier is "excess baggage" in single-sideband systems, it is good practice to transmit a small amount of carrier with the sideband to act as a pilot to aid the receiver in supplying carrier of the correct frequency. This has long been commercial practice and does not interfere in any measurable way with the effective power gain that single-sideband operation offers. In fact, the practical difficulty of taming at least three oscillators (one or more in the transmitter; two in the receiver) so that their combined relative frequency error is not more than about 50 cycles essentially demands that some automatic means be employed to aid in the task. Receivers can be built (and rather simply, too) with a carrier-locking arrangement that requires only a small amount of transmitted carrier to keep the locally-generated carrier absolutely synchronized with that from the transmitter. It has been found that a carrier level 20 db. below reference level (that's 26 db. below the peak output of the transmitter) is sufficient to accomplish this function very satisfactorily. If, for example, the peak power output of a single-sideband transmitter is 100 watts, only ¼ watt of carrier output is needed to overcome this stability problem. Indeed, very little "steam" is wasted in blowing this whistle!

Transmission of this amount of carrier does not interfere with using the b.f.o. in conventional receivers to supply the carrier, since the b.f.o. must be set so closely to this carrier frequency that no audible beat can be heard. In other words, completely-suppressed-carrier operation merely "implies" a carrier frequency, while 20-db.-attenuated-carrier "suggests" the carrier frequency and is a practical necessity for really satisfactory single-sideband operation.

Performance

A transmitter employing the principles presented in this article has been operated on the 14-Mc. 'phone band since February, 1948, with excellent results. Interesting comparisons have been made on many occasions between phase modulation, amplitude modulation and single-sideband — all at the same peak power. Almost universally, the reports of readability and QRM reduction indicate that single sideband really is worth something after all. Many interesting QSOs have been held under conditions that would make communication utterly impossible with amplitude modulation or phase modulation. The receiver employed is one that was converted for single-sideband operation, this playing no small part in the success of many of the contacts. The principle upon which the receiver operates will be described in a subsequent article.

Do we go to single-sideband? The equipment is simple enough; the rest is up to you.

About the Author

• Donald E. Norgaard, W2KUJ, ex-W5ABB-W5ARL, received his first ham ticket in 1931, culminating an interest first stirred up in 1928. An E.E. graduate of Rice Institute, he holds amateur Class A, radiotelegraph second-class, New York State professional engineer, and private aircraft pilot licenses. Although his present work as a research associate at the General Electric Co. keeps him quite busy, Don finds time to engage in amateur experimental work and rag-chewing on the 20-meter 'phone band — that is when he's not flying his Luscombe.

[7] B. Goodman, "What is Single-Sideband Telephony?" *QST*, January, 1948.

[8] O. G. Villard, jr., "Single-Sideband Operating Tests," *QST*, January, 1948.

When Wires Are Down . . .

League and Western Union Reinstate Collaborative Agreement

ALBERT E. HAYES, JR.,* W1IIN

In recognition of the valuable emergency work done by amateurs in the past, and in view of the increasing coverage of the country by the ARRL Emergency Corps, the Western Union Telegraph Company has reinstituted its cooperative program whereby their Office Managers and Superintendents, distributed through some 3500 communities, will contact local amateurs and amateur clubs, with a view toward better liaison between WU and amateurs in time of emergency.

Under the arrangement the amateur is provided with new opportunities for enlarged traffic experience in time of emergency as the result of improved understanding by Western Union personnel of what amateurs can do, as an accomplished group of communicators, when duty calls. By this same token, the wire service benefits by acquiring a competent outlet for its top-priority disaster traffic, the dispatch of which is essential for the prompt restoration of its facilities so that the resumption of normal service may be accelerated.

To further the collaboration between the League and WU, James D. Felsenheld, W2IM (formerly W2GA and W3MI), has been appointed WU director of amateur radio relations, with headquarters at 60 Hudson Street, New York. Instructions have been issued to all Western Union superintendents and managers to make ARRL application forms available to amateurs desiring to join the AEC, and to extend every courtesy to those interested in the handling of public traffic. Radio clubs in the larger cities may feel free to call upon the local Western Union representative to address their meetings and thus gain interesting knowledge of the advancements being made in wire communications.

It is hoped that, before long, each Western Union office will have been written into the community plan of the ARRL Emergency Coördinator for its community, and that the spirit of coöperation resulting from the active participation of the wire company in this program will put the AEC in the best possible position to be of assistance to our country "when the wires are down."

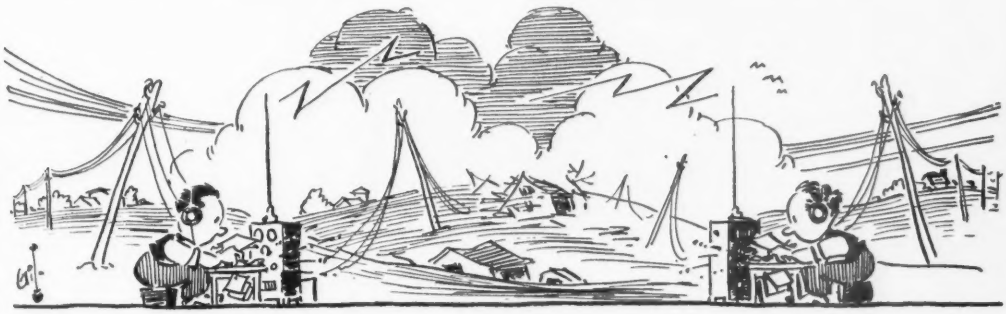
It is interesting to note that during the prewar operation of the plan, amateurs participated in eighteen emergencies during which 144 operators assisted Western Union and, as a gesture of appreciation, were awarded the company's certificate of public service personally signed by its president.

Join the Emergency Corps Today

ARRL earnestly urges *every amateur* not already registered to send a card or message to ARRL for a Form 7, to get one from any League official, or to ask for one at the nearest Western Union office. It is *important* to the amateur service to be able to tell the FCC and the Red Cross that *many* of us are in the organized Emergency Corps. It isn't necessary to be a League member to belong. By whatever route, get lined up with the ARRL Emergency Corps today!

Western Union has agreed to take part with others in expanding the Corps, by promoting reasonably among unaffiliated operators the idea of registering their facilities as a preliminary to receiving the ARRL card that identifies them with the League's Emergency Corps. For that purpose, the WU offices will have the familiar Form 7 registry blanks, available to all licensed radio amateurs, to align them with the Corps. These blanks will be routed by WU to ARRL. As soon as recorded, and the applicant informed, the blanks go to SCMs (and local coördinators where appointed) so complete organization information is available at three points in case of emergency.

*National Emergency Coördinator, ARRL.



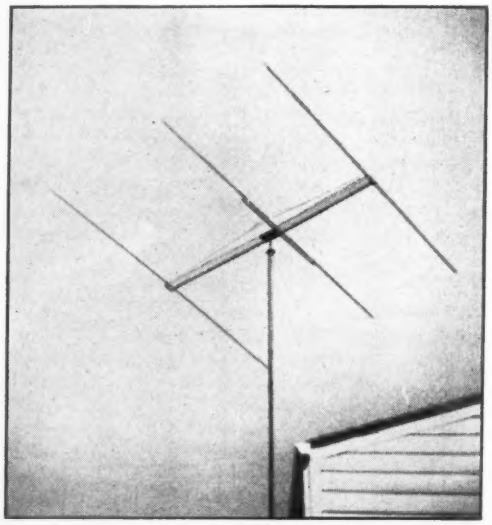
A Transportable 10-Meter Beam

For the Man Who Has To Move Periodically

BY EMMETT P. BONNER,* W4MXP

MANY hams who have to move from time to time hesitate to erect a rotary beam, and so have to content themselves with indoor antennas or fixed outdoor wires. The writer, being in the Navy, was in that category, but finally took the bull by the horns and worked up a light transportable beam. It is hoped that its construction may suggest ideas to other hams similarly situated.

The emphasis in this article is on mechanical construction. The boom alone weighs 4½ pounds while the complete beam, including the elements, weighs 16 pounds. Wind resistance is reduced to a mimimum by the small silhouette area presented. Wire braces permit using light and cheap aluminum angles, and also provide an easy way to correct any horizontal misalignment of the elements. The mast and beam can be dismantled into lengths of not over 12 feet and bound together to form a compact unit for moving.



The mast and beam rotate as a unit in a guyed bearing at the top.

The design features of the beam were taken 100% from *QST* and the ARRL *Handbook*. Wide-spaced "plumber's-delight" construction was employed, using the spacing recommended by Erhorn [1] for maximum gain — 0.15 wavelength spacing for the director and 0.20 for the reflector. The element lengths given in the referenced article were used without further tuning. In order to make use of the inexpensive Twin-Lamp standing-wave indicator, [2] 300-ohm Twin-Lead was used for the feeders. A "T"-match was used, adjusting it by trial-and-error until the top light of the indicator was completely out when the lower light was at full brilliance. Using 1-inch diameter aluminum tubing for the elements and the "T"-match, the spacing for the clamps was 24 inches for 28.6 Mc. This will probably vary, depending on the spacing between the "T"-match and driven element (2 inches in this case) and the relative sizes of the tubing used.

The Pipe Mast

The mast is made of water pipe supported by three guy wires, and is 36 feet high. The pipe was begged, borrowed and bummed from wholesale plumbing-supply houses and scrap piles. The lengths are 12 feet or less and all joints are treated with pipe-thread compound so that the sections can be disassembled. The lower sections are 2-inch pipe, tapering to 1½-inch pipe about halfway up. The final foot or so is ¾-inch pipe, the reducer at this joint serving also as a bearing surface for the guy-wire bearing. An earlier version of the mast used 1-inch pipe for the top half, but the pipe was unable to support its own weight horizontally and broke at the threads while being erected. The 1½-inch pipe has thicker walls, leaving sufficient metal after the threads are cut.

The guy-wire bearing is an iron disk with a hole in the center to pass the ¾-inch pipe, and has three small holes 120° apart near the rim to take the guy wires. The edges of these holes will shear through the guys (the writer found out the hard way) unless thimbles, sister hooks, or chain links are used. The disk rotates smoothly on the reducer between the ¾-inch and 1½-inch pipe. The guy wires are made of cheap No. 12 galvanized iron clothesline wire, and are broken at intervals by porcelain strain insulators. Two guys were attached to the roof edges in this case and the third was led down at about a 45° angle to an iron-pipe stake in the ground.

A lower bearing was constructed at the roof edge, in the form of a strong wooden box nailed to the side of the house. The box was notched to pass the pipe, and a metal strip screwed across the notch after the mast was in place. In lieu of the box bearing, a second bearing similar to the

* 21 Holloman Road, RFD No. 1, Falls Church, Virginia.

[1] Erhorn, "Element Spacing in 3-Element Beams," *QST*, October, 1947.

[2] Wright, "The Twin-Lamp," *QST*, October, 1947, and *The Radio Amateur's Handbook*, p. 494.

guy-wire bearing could be used with a second set of guys.

Beam Elements and Support

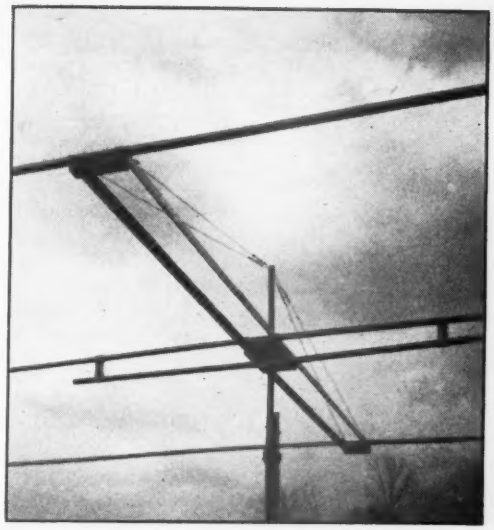
The elements can be made of any tubing available. This beam uses 12-foot lengths of 1-inch o.d. aluminum tubing, $\frac{1}{16}$-inch wall, with $\frac{7}{8}$-inch o.d. sections telescoping in the ends. The boom is made of two parallel aluminum angles 6 inches apart, screwed at both ends to a 2×2 wood block. The angles used were 1 by 1 by $\frac{1}{16}$ inch, and came in 16-foot lengths. The excess lengths (about 4 feet each) were fastened alongside the regular lengths at the center of the boom to make it more rigid.

The center support is 6 by 11 by $1\frac{1}{2}$ inches (two $\frac{3}{4}$-inch boards nailed together will do nicely), with two $\frac{3}{4}$-inch pipe flanges bolted together through it from opposite sides. The exact location of this center support with respect to the boom should be determined by balancing the boom with the elements lashed temporarily in place; it will be about $5\frac{1}{2}$ feet from the forward end of the boom. After the center support is attached with screws, the elements are attached by means of metal straps about 1 inch wide. The straps holding the director and reflector are made a little longer on the inner ends, and an extra hole

Fig. 1 — The simple construction of the 3-element beam is shown by this outline drawing. Dimensions and constructional points are discussed in the text.

is drilled in each strap to provide points for attaching the bracing wires. A 15-inch length of $\frac{3}{4}$-inch pipe is screwed into the upper flange and drilled at the top to provide a point for attaching the upper ends of the braces. Small turnbuckles were inserted in the bracing wires to permit correction of minor misalignment of the elements.

This type of boom was found to be far simpler to use than a 2-inch aluminum tube previously tried. Bolting or otherwise attaching the elements to a tubular boom is a rather difficult task, because the elements do not tend to remain horizontal or parallel to each other. Notching a tubular boom so that the elements are parallel requires precision work and also weakens the boom. (Our first beam broke this way.) The



A close-up of the aluminum-angle boom.

parallel angle stock, on the other hand, is extremely well suited to painless attaching of the elements. Furthermore, the angles cost about $2 all told, against $5 for the tube.

Putting It Up

The feeders were led up through the mast as it was assembled, entering and leaving the mast through small slots cut with a hack saw.[3] They could be led up outside the mast, but tend to foul the guy wires when the mast and beam rotate together.

Raising the beam is the most complicated part of the whole business. The method used was to lift the mast onto a temporary support — 2×4s nailed in the shape of a large "X" with a third board nailed across the bottom to keep the support from spreading — then, holding the beam perpendicular to the mast, the mast was screwed into the bottom flange. After the beam was tightened in place on the mast, the guy wires were connected to the disk and the feeders were connected to the "T"-match. A simple wooden mast step was made to keep the mast from digging into the ground. At this point the neighbors were called in to help swing the completed beam and mast into its final position. Lowering the beam could conceivably be done by one man, using a block and tackle.

This particular beam is screwed into a pipe flange which is welded to the top gear of a surplus propeller-pitch motor, but it is suitable for practically any system of rotation, including hand

[3] Running 300-ohm line through small-diameter pipe is likely to affect its characteristic impedance and make it impossible to eliminate standing waves. Coaxial cable would be better suited to this type of mounting, but should be provided with a "bazooka" at the antenna end. — *Ed.*

25 Years Ago
this month

"WIRELESS NORTH POLE — NEXT!" Thus June 1923 *QST* sets its sights on the next target of our accomplished DX-chasing brethren. ARRL Publicity Manager "Jake" Bolles enthusiastically tells of our Board of Direction's approval of arrangements worked out between President Maxim and Dr. Donald B. MacMillan, noted explorer, for amateur two-way communication with the schooner *Bowdoin* during this year's expedition to the Arctic Circle. Questionnaires are now being circulated to select a qualified amateur to represent ARRL on the mission. Listen for WNP — Wireless North Pole!

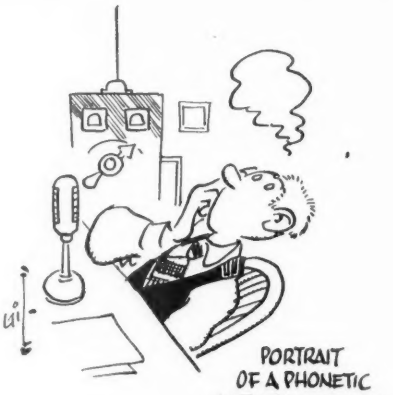
The books have been officially closed on the overwhelmingly-successful Third Transatlantics with publication this issue of the formal reception reports from England, France, Holland and Switzerland. To provide an insight into amateur radio "over there," we have a description of the one-kilowatt installation at 5WS, outstanding station of RSGB during the Tests.

Early-summer QRN is back with us, but it hasn't proved a serious obstacle to the efforts of the c.w. clan. However, the spark hangers-on are really feeling its effects, handling only 6% of last month's traffic. No opportunity has been missed this *QST* to provide material on the betterment of our c.w. rigs. Technical Editor Kruse describes "The Reinartz Modulascope," 1QP's easy-to-build device for visually checking carrier ripple. A Tesla coil with brush-discharging wire spinner does the trick. A d.c. motor can be conveniently rewound to make a plate-voltage generator, according to C. C. Brown, 6KU, who gives the practical viewpoint on the electrical and mechanical considerations involved. The large number of fatalities among filament transformers in rigs using the familiar "Stanley" or "1DH" circuit at high plate voltages can be attributed to the secondary being operated above ground by an amount equal to the plate voltage, we learn. A change to circuits that allow a grounded filament center-tap is recommended by Technical Editor Kruse. Capacitive coupling of the c.w. transmitter to an antenna operated at its fundamental is advocated by V. D. and E. B. Landon, 8VN, who claim higher efficiency for this method.

The quest for receiver selectivity and stability continues. "Radio Filters," efficient though simple tuned circuits for discriminating against radiophone and spark interference, are detailed by Melville Eastham, president of General Radio. *QST* is enthusiastic about these new wavetraps: ". . . a magical instrument that . . gives you the power to destroy interfering sta-

(*Continued on page 112*)

'Phone-Band Phunnies



The Phonetic Artiste

THIS character has the soul of a great artist, and he stoutly refuses to be bound by the narrow confines of the ARRL Phonetic Code in giving his call letters. That "Adam-Baker-Charlie" stuff is all right for the peasants; but he wants something that will make his call stand out — you know: something original, catchy!

It is truly wonderful to hear what he dreams up. If four-letter calls were issued (this is a sneaky way to avoid libel suits), you would doubtless hear "W5 Grandma's Light Green Unmentionables" or "W2 Sure Do Love Women" or "W6 World's Most Haywire Rig." The presence of a "Z" or an "X" in his call spurs him on to a very frenzy of invention, and he is quite likely to develop an ulcer trying to work "xylophone" or "zoo" into a snappy slogan.

All this terrific effort is rather astounding when you consider that the whole purpose of phonetic aids is to make the call letters more easily identified. Why doesn't the guy be consistent and have his house numbers printed in Egyptian hieroglyphics and arranged in an artistically-illegible monogram?

No such niceties of logic bother our hero, though; he keeps right on dreaming them up — not only for his own call but for the calls of those whom he works. As a crowning example of just how bad this thing *can* get, a Midwestern ham with the letters "EGV" is often heard referring to himself as "Ether's Golden Voice." Did you ever hear anything more nauseating?

— *John T. Frye, W9EGV*

(*Thanks to a suggestion from Keith Olson, W7FS.*)

The World Above 50 Mc.

CONDUCTED BY E. P. TILTON,* W1HDQ

WITH the 50-Mc. gang still waiting for the first major opening of the spring DX season as April came to a close, the 2-meter band steals the headlines in the news of the month's v.h.f. activities. While nothing approaching a new record for 144 Mc. was worked, the number of contacts made at distances beyond 200 miles during April, a month when operating ranges are only beginning to stretch out, gives some indication of what may be expected in the best months for tropospheric DX now just ahead of us.

The North Atlantic Seaboard DX season officially opened on the evening of April 19th, when VE1QY, Yarmouth, Nova Scotia, worked a string of W1s and W2s. A pronounced skip effect was in evidence, with W2s in the region around New York City coming in strongly, while W1s in Connecticut, Rhode Island, and on Cape Cod were much weaker. Boston-area stations, still nearer Yarmouth and with only water intervening, were not heard at all by VE1QY, and the few in this region who heard him reported his signals weak at best.

Between 8:15 and 11 P.M. on the 19th, VE1QY worked W2BAV, Bedford, N. Y., W1SF, Branford, Conn., W1DAH, N. Scituate, R. I., W2MO, Livingston, N. J., W2NPJ, Elizabeth, N. J., W2NLY, S. Plainfield, N. J., W2MLF, Fanwood, N. J., W2BLF, Newark, W2SVI, New York City, W2NGA, Bronx, N. Y., W2UPY, Patterson, N. J., and W2WLS, Farmingville, N. Y. Signals heard included W1PBB, W2MCG, W1DHX, W2KDX, W2QUF and W1BCN. The most distant of these, W2NLY, represents a hop of some 450 miles, with the Boston area (and its hundreds of 2-meter stations) almost directly in the path at a distance of only about 275 miles from Yarmouth.

On 6 the news is still mostly from the Latin American countries, though unquestionably the spring season's big doings will have been well underway in this country before this department reaches its customers. Some idea of the reliability of the Mexico-to-Argentina 50-Mc. circuit can be gained from the record of XE1KE, who reports that from February 18th to April 28th there were only six or seven days when he did not work or hear LUs, and even on some of these days the band may have been open! There were two distinct types of openings, the most common being the almost nightly one which developed around 6 to 7:45 CST, with LUs and CXs coming through with a rapid flutter, but with quite strong signals. More rarely, the band opened around 3 P.M., and then the signals sounded more like DX signals do on 10. On April 3rd such an opening lasted from 3:45 to 5:30, during which LU9EV worked 3 Mexican stations and XE1KE worked 8 LUs and CX3AA. The band reopened with the customary fluttery signals from Argentina at 6:55 P.M.

On other South American paths the DX showed some tapering off from March levels, but stations in Peru, Surinam, Brazil, Argentina, Chile and Uruguay were still finding the band open at fairly frequent intervals, mostly during the evening hours. During the evenings of April 4th and 5th KP4AZ heard LU9EV, LU5CK, and several other signals of Spanish-speaking stations.

The South Atlantic has yet to be bridged two-way on 50 Mc., though it is established that the path between South America and South Africa has been open on several occasions. CE1AH heard the signal of ZS1P when the latter was testing with G5BY, and ZS6GX heard CE1AH when Ida was trying to raise ZS1P, but no two-way work has yet been done. The m.u.f. along that

WE CHANGE TO 220 MC.

Shift from 235 to 220 Mc. Effective April 28th.

As detailed elsewhere in this issue, the anticipated shift of our 1¼-meter band from its temporary assignment at 235 to 240 Mc. to the permanent allocation at 220 to 225 Mc. was announced by FCC on April 28th, effective at once. In order to provide ample time for changing over to the new band, the 235-Mc. band will remain available to amateurs until midnight, June 8th, and both assignments may be used until that time.

Subject to the remote possibility of interference to certain distance-measuring devices employed on aircraft of foreign countries, the 235-Mc. band will be held for amateur use in such areas as interference to this service might dictate. Otherwise all operation by amateurs in the 235–240-Mc. band will cease after June 8th.

* V.H.F. Editor, *QST*.

RECORDS

Two-Way Work

50 Mc.: CE1AH — J9AAO
10,500 Miles — October 17, 1947

144 Mc.: W3GV — W9WGZ
660 Miles — September 18, 1947

235 Mc.: W1CTW — W2HWX
210 Miles — October 12, 1947

420 Mc.: W6VIX/6 — W6ZRN/6
186 Miles — July 27, 1947

1215 Mc.: W3MLN/3 — W3HFW/3
12.5 Miles — September 24, 1947

2300 Mc.: W1JSM/1 — W1HLS/1
66 Miles — October 5, 1947

3300 Mc.: W6IFE/6 — W6ET/6
150 Miles — October 5, 1947

5250 Mc.: W2LGF/2 — W7FQF/2
31 Miles — December 2, 1945

10,000 Mc.: W4HPJ/3 — W6IFE/3
7.65 Miles — July 11, 1946

21,000 Mc.: W1NVL/2 — W9SAD/2
800 Feet — May 18, 1946

path appeared to be dropping off in late April, and it is probable that the last opportunity for a CE-ZS 50-Mc. QSO has passed for this season.

In all the years since the first v.h.f. DX was heard, we've had some strange doings reported on the v.h.f. bands. Here is one such: On March 27th VE5CO, Moosejaw, Saskatchewan, heard VS5Y on about 54 Mc. Heard first around noon (MST) the signal was in again around 1:27. The operator had a pronounced English accent and delivery, and appeared to be testing with another station. Can anyone furnish more details?

The spring of 1948 has been conspicuous for at least one thing: the lack of aurora DX on 50 Mc. The period from February through April usually provides several openings of this nature, but even the 10-meter band has seen very little sign of it this year. Between 7:07 and 7:15 P.M. CST on April 7th W9NJT, Watertown, Wis., heard W1AW and one unidentified commercial signal (where was everybody else?) and again on the 13th he worked W9PK and heard W9ALU and W9EVL.

There was a bright aurora in New England just before midnight April 21st, but it came too late to find many of the gang in the East still active. Those two reliables, W2AMJ and W2BYM, worked some W8s, but otherwise little has been reported on 6. W3RUE, Pittsburgh, Penna., was on the job, however, and as he has done whenever aurora signals have been heard on 6, he checked the 2-meter band to see if anything peculiar was in evidence. Long ago he'd decided that the aurora had no effect on 2-meter propagation, but this night he heard a signal on 144.2 Mc. which had all the earmarks of aurora reflection. Swinging the beam to the north brought the signal up markedly, but the voice was unreadable because of the characteristic aurora fuzz. When it went off Ted called CQ on c.w. and the signal came back again, still on 'phone and unreadable. After several tries the signal faded out. Has anyone else had similar experiences on 144 Mc.?

V.H.F. Doings at the National ARRL Convention

For several months the Milwaukee Radio Amateurs' Club has been hard at work on plans for the forthcoming National ARRL Convention to be held in Milwaukee, Wisconsin, Sept. 4th, 5th and 6th. This would appear to be the right spot for the nationwide v.h.f. get-together, ideas for which have been bouncing around for some time. Every effort is being made by the Convention Committee to provide adequate facilities for the v.h.f. fraternity. A special V.H.F. Committee under the chairmanship of Frank Maiorana, W9TPT, is arranging an extensive program of v.h.f. activities, and a total of eleven hours of convention program time is set aside specifically for this purpose.

There will be hidden-transmitter hunts and other outdoor activities, including a competition for the best mobile installation. Fine prizes will be available for these, as well as for other competitions, the object of which is to encourage the amateur v.h.f. experimenter to show his wares at the convention. V.h.f. exciters, converters and microwave transmitters will be the subject of individual competitions. Persons desiring to enter these judging competitions are requested to get in touch with Jack Doyle, W9GPI, general convention chairman, 4331 N. Wildwood Ave., Milwaukee 11, Wis.

A period of four hours is being allotted to a v.h.f. get-together Saturday night. Sunday morning will feature transmitter hunts, demonstrations of u.h.f. and microwave gear, and the various judging competitions. More v.h.f. talks and meetings are scheduled for Monday morning, ending in awarding of the v.h.f. prizes.

Many notables in the v.h.f. field are expected to be present, and the time available should make it possible to hear from everyone. Here, at last, is a convention where the v.h.f. man can feel at home. He will have ample opportunity to meet with others whose interests follow the same channels, instead of having a few minutes sandwiched in at some inconvenient time in the program. So let's make it a date — see you in Milwaukee!

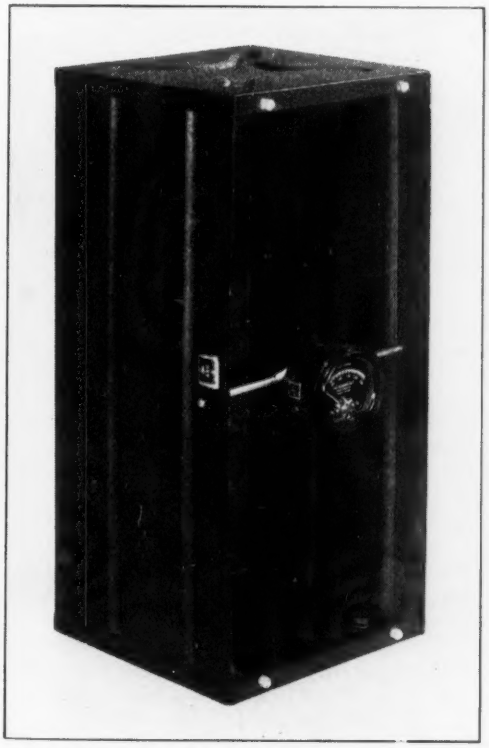
Helpful Hints Department

Ever try to get a radiation pattern of your 420-Mc. array? If you have, you know that reflections from surrounding objects can be mighty confusing. A person walking several wavelengths in back of the field-strength meter, for instance, will cause readings to vary widely. To get around this difficulty, W3GKP, Silver Spring, Maryland, uses one of the CS-48 storage cases from the

tuning units of the BC-375 transmitter as a slot or cavity antenna for his field-strength meter.

To check the idea a similar unit was built in the Headquarters lab, and a photograph is reproduced herewith. As may be seen, a microammeter is mounted at the center of the box opening, in series with a crystal diode and two short lengths of tubing. Copper tubing $\frac{3}{16}$ inch in diameter was used, as this can be readily tapped with a 6-32 thread. One section of tubing has a loop of No. 16 wire soldered to it to form a lug fitting over the meter terminal. The other piece is soldered to a 1N34 diode, the other end of which connects to the other meter terminal. The two pieces are just long enough to fit inside the box and are fastened in place with short 6-32 screws through the sides of the box.

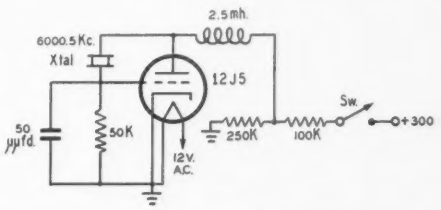
Polarization is parallel to the wire; that is, with the unit in the position shown, polarization is horizontal. The main lobe is in front of the open side of the box. The arrangement has a useful gain over a dipole, in addition to greatly reducing trouble experienced from reflections. The only disadvantage Smitty can think of is that, with the box having a cut-off frequency of about 300 to 350 Mc., the gadget is good only for 420 Mc. and higher. He suggests that some reader put him in touch with a reputable grave robber, who would dig him up a 144-Mc. job!



A field-strength indicator for 420 Mc. made from the case of a BC-375 tuning unit, a microammeter, a 1N34 crystal, and two pieces of copper tubing. This model was assembled in the Headquarters lab at the suggestion of W3GKP, who uses a similar arrangement to eliminate reflections from objects in back of the meter.

A B.F.O. for the 522 Receiver

With the increased use of c.w. on 144 Mc., the users of 522 receivers are at some disadvantage in having no beat oscillators. And even if the operator is one of those who is allergic to c.w. as a mode of communication, the b.f.o. is still a mighty handy article in combing the band for the weaker sigs. WØCCY, Council Bluffs, Iowa, uses the crystal-controlled b.f.o. shown in Fig. 1. The complete story is on the diagram, and values are not critical. No injection coupling was needed in his case, the second harmonic being strong enough for b.f.o. purposes with no more coupling than that afforded by the receiver wiring.



Schematic diagram of the Pierce oscillator used as a b.f.o. in a 522 receiver by WØCCY. Values are not critical, and no injection coupling is required.

Here and There

Houston, Texas — The 144-Mc. DX season starts early along the Gulf Coast. As early as March 23rd five stations in Corpus Christi came through in Houston with good signals, according to W5FSC. W5SM in Beaumont heard a station in Harlingen, a distance of about 350 miles. Kingsville, about 150 miles to the south, is the best DX worked on 144 Mc. from Houston so far. W5SM, Beaumont, and W5DAA, Kingsville, hold the two-way record for the Gulf Coast, about 290 miles. The Houston area should have good representation on 50 Mc. this year, as W5s IGL, KFY, MRV, FSC, EEX, BHO, ADZ, and UW are all set for business.

Sea Girt, N. J. — Having a horizontal 144-Mc. array paid dividends for W2OOC on the night of April 4th. Hearing stations coming through unusually well on his vertical, W2OOC swung his newly-erected horizontal around to the south. Out dropped the QRM from the near-by vertical locals and there was W4CLY, Cape Henry, Va., rolling in S8. Between 11:30 P.M. and 12:30 A.M. contacts were made with W4IKZ, near Norfolk, W4CLY and W4JFU, Parksley, Va., all horizontally-polarized. The distance is in excess of 250 miles.

W4FJ, Richmond, Va., reports loud signals from horizontally-polarized W3KCA, Baltimore,

Standings as of April 30th

W1CLS	44	W5VY	40	W9ZHL	43
W3CIR/1	42	W5ML	38	W9JMS	36
W1LLL	40	W5AJG	38	W9ALU	34
W1HDQ	39	W5JLY	38	W9QKM	33
W1CGY	38	W5FRD	38	W9UIA	31
W1HMS	36	W5ZZF	34	W9AB	23
W1JLK	35	W5FSC	34		
W1NF	35	W5LIU	24	WØUSI	45
W1LSN	33			WØQIN	43
W1CLH	32	**W6UXN**	**46**	WØZJB	43
W1CJL	30	W6OVK	38	WØDZM	42
W1AF	27	W6ANN	38	WØTQK	42
W1EIO	24	W6BPT	34	WØSV	42
W1HIL	21	W6IWS	32	WØBJF	42
		W6FPV	31	WØHXY	41
W2BYM	39	W6WNN	24	WØINI	41
W2AMJ	38	W6EUL	22	WØYUQ	39
W2IDZ	37	W6HZ	13	WØJHS	38
W2QVH	37	W6BWG	12	WØPKD	36
W2RLV	37				
		W7BQX	43	VE1QY	28
W3OR	35	W7ERA	43	VE3ANY	27
W1KMZ/3	33	W7HEA	40	VE1QZ	24
W3MKL	33	W7DYD	37	G5BY	24
W3RUE	32	W7FDJ	36	VE2KH	19
W3MQU	15	W7FFE	35	VE2GT	14
W3GKP	12	W7KAD	35	XE1KE	13
		W7JPA	34		
W4GJO	**46**	W7QAP	30		
W4QN	40	W7ACD	27		
W4GIY	40	W7JPN	19		
W4EQM	40	W7OWX	15		
W4EID	38				
W4WMI	33	W8QYD	39		
W4FBH	31	W8RFW	25		
W4HVV	29	W8TDJ	22		
W4FJ	26				
W4FNR	25	**W9DWU**	**46**		
W4EMM	25	W9PK	43		
W4JML	20				

Note: This list covers states worked since March 1, 1946. Send in monthly reports of states worked in 1948 on 50, 144, 220 Mc. and higher, for entry in the 1948 Most-States-Worked Contest. See January *QST*, page 150, for details. Standings will be published when sufficient entries have been received.

and W3ENZ, Washington, this same evening. W3DOG, Laurel, Delaware, was strong despite his vertical array, and his contact with W4IKZ rates as the season's cross-polarization DX.

South Plainfield, N. J. — How many stations can be worked on 144 Mc.? W2NLY is well past his first thousand and still going strong! Jim makes a plea for more use of c.w. on 144 Mc. In the midst of the welter of activity in that metropolitan area weak DX signals are much more readily identified on c.w. than on 'phone. Weak carriers are often heard in the direction of W4 which would be solidly readable on c.w.

Maspeth, N. Y. — The more than a thousand stations in the Greater New York area constitute the main reason behind the decision of the V.H.F. Institute of New York to remain vertically polarized. Many of the stations in heavily-populated areas are not able to put up rotatable arrays, and, where a simple fixed antenna must be used, results are bound to be better with vertical polarization. The large numbers of mobile stations, and the presence of television and f.m. receivers using horizontal antennas, are two more reasons for their continuing with vertical polarization.

Louisville, Ky. — An emergency net is operating in the Louisville area on 145.8 Mc. Persons interested in participating are requested to get in touch with W4BPE or W4FBJ.

Atlanta, Ga. — The Atlanta-area emergency net operates on 144.138 Mc. each Monday at 8:30 P.M. At 9 P.M. they stand by for contacts outside the area, and schedules for this period are solicited. W4LNG and W4KHL made a trip to Westminster, South Carolina, on March 27th and worked W4LMF of Atlanta and heard W4KIP. The following day they journeyed to Bald Mountain, near Franklin, North Carolina, where the same two stations were heard with good strength. Trouble developed in the portable rig, however, so no contacts were made.

Medford, Mass. — W1KNI reports that W1BZN is trying out circular polarization on 420 Mc. Rotating the 16-element array at W1KNI from vertical to horizontal produces a change of less than ten per cent in signal level at W1BZN when the circularly-polarized antenna is used for receiving. W1KNI has been trying some i.f.-strip modifications in his APS-13. Removing the loading resistors sharpened the i.f. too much for the unstable signals on the band. A try for a.v.c. was not too successful, as the 6AG5 is not well suited to this sort of operation.

Tucson, Ariz. — The 50-Mc. group in this area now comprises W7s OWX, UPF, UPR and QAP. No DX was heard up to the latter part of April, but W7QAP reports that he will be on the band regularly between 5 and 10 P.M. MST, watching for openings. Bud is also on 144 Mc. and would like some early-morning schedules with stations in the vicinity of Phoenix.

San Bernardino, Calif. — Activity on 144 Mc. is growing by leaps and bounds according to W6UAH, who lists 19 stations as most active: W6s CON, DMQ, HCX, HKD, JZT, KBG, KKG, QUK, RSN, RUT, RSR, RXA, SJB, UAH, UXG, VSF, WTT, YAB and WØHHN/6. Contact is made with stations in the Los Angeles area, some 60 to 80 miles to the west, by pointing directional arrays at Mt. San Bernardino, due east. Direct-line contacts are extremely poor. W6QUK has worked San Diego, more than 100 miles distant, over very high mountains. Lancaster, about 40 miles out in the desert, with

(*Continued on page 112*)

HAMFEST CALENDAR

ALABAMA — The Annual Field Day & Hamfest of the Anniston Radio Club will be held on Sunday, June 13th, on Cheaha Mountain, 20 miles south of Anniston. Good food, games, competitions and rag-chewing will be the fun of the day. Bring the family! Tickets are available from W. L. Robinson, W4GYD, 415 Goodwin Circle, Anniston, Alabama.

ILLINOIS — All roads will lead to Camp Ki-Shau-Wau — near Starved Rock State Park — on Sunday, June 6th, when the Starved Rock Radio Club holds its big Hamfest. Follow the signs south from the junction of Illinois Routes 71 and 178. Entertainment, speakers, exhibits, contests and refreshments are programmed, starting at 10:00 A.M., rain or shine. Lunch will be available at the camp. Registration $1.00.

ILLINOIS — June 27th is this year's date for the Annual Picnic of the Illinois Central Radio Amateur Association, which is composed of the Twin City, Cenois, and Kickapoo Radio Operators clubs. The get-together will be held in the amphitheater overlooking the lake at Weldon Springs Park, near Clinton. There is no registration charge, and hams and their friends are invited. Bring your own lunch — the association will furnish free soft drinks. Further particulars may be obtained from Ed Harney, W9PEK, 521 N. Quincy Street, Clinton, Ill.

MINNESOTA — A bang-up program has been arranged for the first postwar Gopher Hamfest, to be held Friday and Saturday, June 18th–19th, under the auspices of the Minneapolis and St. Paul Radio Clubs. The affair, to be held at the Hotel Nicollet, Minneapolis, will feature technical talks, contests, turkey dinner and entertainment. Reservations made by June 14th, $5.00; at hamfest, $5.50. Ladies $3.50. Free rooms are available at the homes of local amateurs for advance registrants if requested. For tickets and information write Gopher Hamfest, Box 685, Minneapolis, Minnesota.

VERMONT — The Burlington Amateur Radio Club is sponsoring the Northern Region Hamfest on Saturday, July 3rd, at the Heineberg Community Club, Burlington. A lively program has been planned, including a 2-meter treasure hunt, ARRL Club Award code contest, technical speakers. Emergency Corps meeting, eats and dancing. Registration: OMs $3.00, XYLs and YLs 75¢. Burt Dean, W1NLO, P.O. Box 81, Burlington, Vt., will be glad to supply further information.

Silent Keys

IT IS with deep regret that we record the passing of these amateurs:

W1FX, H. R. McLane, Laconia, N. H.
W2OVQ, Lawrence B. Wollins, Yonkers, N. Y.
W4FXL, Thomas M. Mason, Meriweather, S. C.
W4GIC, Wendell L. Longstreth, Bradenton Beach, Fla.
W4PK, George W. Clark, jr., Jacksonville, Fla.
W5ASJ, Stewart E. Atwood, Shreveport, La.
W6VIY, Eugene S. Brown, Long Beach, Calif.
W8HDU, Harold E. Forest, Toledo, Ohio
W9SKA, William E. Flood, River Forest, Ill.
G3NI, Frank Jackson, Camsborough, Yorkshire

A.R.R.L. QSL BUREAU

FOR the convenience of American and Canadian amateurs, the League maintains a QSL-card distributing system which operates through volunteer district QSL managers in each call area. To secure such foreign cards as may be received for you, send your district manager a stationer's-size No. 10 stamped self-addressed envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six cents postage. Your own name and address go in the customary place on the face, and your station call should be printed prominently in the upper left-hand corner. If you have held other calls in previous years, submit an envelope for each such call to the proper manager — there are many thousands of uncalled-for cards in the files. All incoming cards are routed by Hq. to the *home district* of the call shown in the address. Therefore, cards for portable operation in other districts should be obtained from the home-district manager.

W1, K1 — Charles Mellen, W1FH, 320 Cornell St., Boston, Mass.
W2, K2 — Henry W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.
W3, K3 — Jesse Bieberman, W3KT, Box 34, Philadelphia, Pa.
W4, K4 — Johnny Dortch, W4DDF, 1611 East Cahal Ave., Nashville, Tenn.
W5, K5 — L. W. May, jr., W5AJG, 9428 Hobart St., Dallas 18, Texas.
W6, K6 — Horace R. Greer, W6TI, 414 Fairmount Ave., Oakland, Calif.
W7, K7 — Frank E. Pratt, W7DXZ, 5023 S. Ferry St., Tacoma, Wash.
W8, K8 — Fred W. Allen, W8GER, 1959 Riverside Drive, Dayton 5, Ohio.
W9, K9 — John F. Schneider, W9CFT, 311 W. Ross Ave., Wausau, Wis.
WØ, KØ — Alva A. Smith, WØDMA, 238 East Main St., Caledonia, Minn.
VE1 — L. J. Fader, VE1FQ, 125 Henry St., Halifax, N. S.
VE2 — Austin A. W. Smith, VE2UW, 6164 Jeanne Mance, Montreal 8, Que.
VE3 — W. Bert Knowles, VE3QB, Lanark, Ont.
VE4 — Len Cuff, VE4LC, 286 Rutland St., St. James, Manitoba.
VE5 — Fred Ward, VE5OP, 899 Connaught Ave., Moose Jaw, Sask.
VE6 — W. R. Savage, VE6EO, 329 15th St. North, Lethbridge, Alta.
VE7 — H. R. Hough, VE7HR, 1785 Emerson St., Victoria, B. C.
VE8 — Yukon A. R. C., P. O. Box 268, Whitehorse, Y. T.
KP4 — E. W. Mayer, KP4KD, P. O. Box 1061, San Juan, P. R.
KZ5 — C.Z.A.R.A., Box 407, Balboa, Canal Zone.
KH6 — Andy H. Fuchikami, KH6BA, 2543 Namauu Dr., Honolulu, T. H.
KL7 — J. W. McKinley, KL7CK, Box 1533, Juneau, Alaska.

Strays

For the benefit of the ham who lost his grid drive the other night, WØQVA calls attention to the following ad from the Burlington (Iowa) *Hawk-Eye Gazette:*

MILLIAMPERES found. Owner identify and pay for ad. Call at Want Ad department.

Tripling to 420

A Simple Frequency Multiplier To Provide Useful Output on 420 Mc.

BY JAMES W. BRANNIN,* W6OVK

• The modulated oscillator has been the generally-accepted means of getting started on 420 Mc., and it probably will remain so for some time, but the generation of useful amounts of stable energy at 420 Mc. is not necessarily difficult. Here W6OVK describes a tripler that can be used in conjunction with a 2-meter crystal rig to provide several watts of power in our lowest u.h.f. band.

AFTER playing around a bit with self-excited oscillators in the 420-Mc. band and experiencing the usual pulling, downward modulation, and other troubles which are characteristic of modulated oscillators on this and other bands, it was decided that some sort of frequency-controlled transmitter would be the only really satisfactory way to operate in this territory. A likely tube or pair of tubes which would perform as a tripler or amplifier at these frequencies appeared to be too much for the old pocketbook, so the project was confined to wishful thinking until Milt Cooper, W6QT, passed along the information that he was doing a pretty good job with an SCR-522, operating in the 420-Mc. band with no changes in the tube line-up!

Thanks to this suggestion, we are now pushing several watts of crystal-controlled power into the antenna coaxial line, putting an S9 signal into Berkeley, some 30 miles across the bay; yet the pocketbook is hardly the worse off for it.

Nothing difficult or tricky is involved in attaining this end, the principal element of novelty being the arrangement of the tripler plate-tank circuit. The 832-A is driven harder and biased higher than would be considered necessary for operation at a lower frequency. A minimum of 10 watts should be available for this purpose, and the driver may well be a 522 or similar rig normally used for 144-Mc. operation. Any frequency in the 144-Mc. band is suitable for tripling purposes. The tripler plate circuit is simply a "U"-shaped loop, which is tuned by means of a small copper disk mounted just above it. A 60-ma. pilot lamp coupled loosely to the plate circuit serves as the best indication of resonance, there being almost no dip in plate current as the tank circuit is tuned for maximum output.

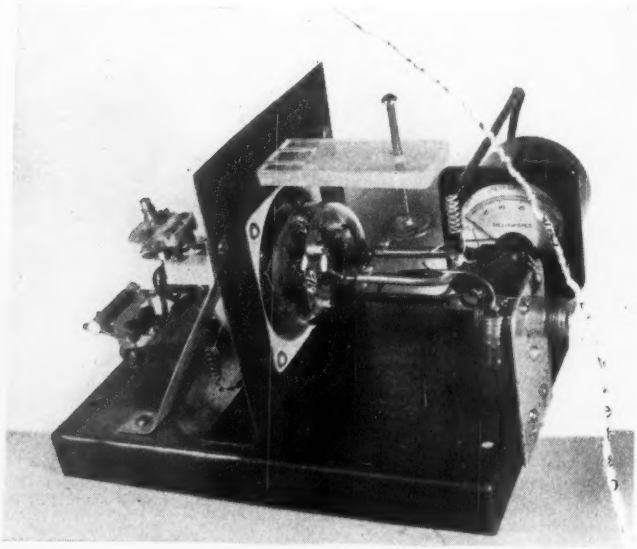
* 225 Park St., Redwood City, Calif.

Physical Layout

The chassis was made by mounting a 5 × 5-inch piece of sheet copper in an upright position on an old switch-box lid, the sheet copper being held in place by two metal angle brackets. The tube is mounted horizontally for obvious reasons. A piece of ¼-inch polystyrene is used as a support for the tuning disk, although any other material could be substituted. The means of mounting the disk and support are clear from the accompanying photograph.

The tube socket is the type that provides shielding and by-passing of the screen and filament terminals as an integral part of the socket, and is to be preferred for high-frequency use. The grid coil and tuning condenser are mounted on stand-offs attached to the base of the socket. The two-turn grid link is attached to terminals mounted in a small block of polystyrene at the back of the chassis.

The plate line is made of 3/16-



The 832-A tripler described by W6OVK.

About the Author

• James W. Brannin, W6OVK, needs no introduction to readers whose main interest in amateur radio lies in the frequencies above 50 Mc. He was first licensed in 1920 as 5OK, and has also held W2BYE and W5DCI, as well as his present call. He is one of those old-timers who has gone through the DX and traffic phases of hamming and now finds his main enjoyment in v.h.f. experimental work, his record on 6, 5, 2½, 2, and 1¼ meters establishing him as one of the leaders in this field.

inch copper tubing bent into a "U," the sides of which are 1½ inches long and 13/16 inch between centers, at which spacing they just slide over the 832-A plate pins. The ends are tapped for 4-36 screws which serve to hold the line firmly on the plate terminals. The top of the upright bracket, on which the coaxial antenna connector is mounted, is even with the level of the plate line and is used as the ground point of the by-pass condenser, C_3. Plate voltage is fed into the middle of the "U" through a small r.f. choke. Above the line is the loop for the indicator lamp, and below it is the coupling loop which is connected to the coaxial output fitting.

Tuning & Operation

For best results the tube must be driven fairly hard, a minimum of 10 watts being desirable. Tuning of the grid circuit may be accomplished by means of a 60-ma. lamp coupled to the grid coil. After an approximate setting has been obtained, the loop may be removed and the grid circuit tuned for maximum output from the plate circuit, as indicated in the lamp coupled to the plate line.

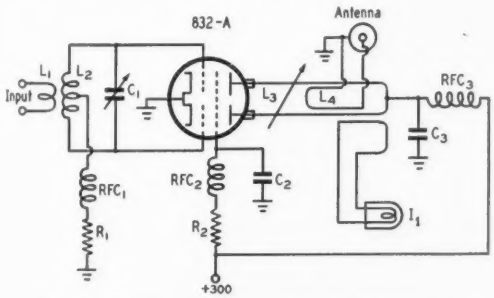


Fig. 1 — Schematic diagram of the 420-Mc. tripler.
C_1 — 25-$\mu\mu$fd. midget variable.
C_2 — Screen by-pass, built into socket. Use 100 $\mu\mu$fd. if external.
C_3 — 100-$\mu\mu$fd. mica.
R_1 — 0.4 megohm, 2 watts.
R_2 — 25,000 ohms, 10 watts.
L_1 — 2 turns No. 18 insulated, tightly coupled to L_2.
L_2 — 3 turns No. 14, ½-inch diameter, ½ inch long.
L_3 — Plate line; see sketch.
L_4 — Hairpin loop; see photograph.
I_1 — 60-ma. pilot lamp, with hairpin loop.
RFC_1 — 50 turns No. 28 d.s.c. on ¼-inch rod.
RFC_2, RFC_3 — 5 turns No. 20, 3/16-inch diameter, ½ inch long.

Some adjustment of the position of the plate line on the tube pins may be necessary to establish resonance in the plate circuit, as there is an appreciable variation in the output capacitance and lead length of various 832-A tubes. It may even be necessary to change the length of the "U" a small amount one way or the other. The length of the loop, or its position on the plate pins, should be adjusted so that the circuit resonates with the tuning disk at the approximate position shown in the photograph. As attachment of the antenna and adjustment of the position of the output coupling loop affect the setting

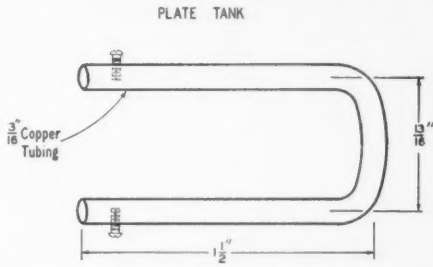


Fig. 2 — Detail drawing of the 832-A plate line.

of the tuning disk considerably, it is advisable to readjust it carefully once the antenna has been connected. Some sort of field-strength meter is almost a necessity in this procedure.

Initial adjustments should be made with low plate and screen voltages to prevent damage to the tube. About 200 volts on the plate and 150 on the screen will do. This precaution may save an 832, and several 60-ma. pilot lamps as well. After the circuits are properly adjusted the plate voltage may be increased to 300 and the screen voltage to 220. Plate current, under these conditions, will be about 60 ma. The coupling to the output indicator lamp should be reduced before the voltage is raised. This coupling should be just sufficient to produce a visible indication for tuning purposes.

With an input of 18 to 22 watts the measured output was about 6 watts, and upward modulation was obtained on the first trial. It is felt that this tripler offers an easy way for anyone now having a crystal-controlled rig on 144 Mc. to get on 420 as well. Its cost and complexity are comparable to a modulated oscillator of the same power capability, yet the results obtained are far more satisfactory.

Revised WWV Schedule

STANDARD-FREQUENCY transmissions are made continuously, day and night, as a public service by the National Bureau of Standards over its standard-frequency station, WWV, on the following frequencies:

Mc.	*Power (kw.)*	*Audio Freq. (cycles)*
2.5	0.7	1 and 440
5.0	8.0	1 and 440
10.0	9.0	1, 440 and 4000
15.0	9.0	1, 440 and 4000
20.0	8.5	1, 440 and 4000
25.0	0.1	1, 440 and 4000
30.0	0.1	1 and 440
35.0	0.1	1

A 0.005-second pulse may be heard as a faint tick every second, except the 59th second of each minute. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted at precisely one minute *before* each hour and each five minutes thereafter (59th minute; 4 minutes past hour, 9 minutes past hour, etc.), resuming after an interval of precisely one minute. This one-minute interval is provided to give Eastern Standard Time in telegraphic code and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. Ionospheric-disturbance warnings applicable to the North Atlantic path are given at 19 and 49 minutes past each hour. If a disturbance is in progress or is anticipated within 12 hours, the time announcement is followed by 6 Ws; if conditions are quiet or normal, the time announcement is followed by 8 Ns. The announcements of the station's services and of the station's call (WWV) are given by voice at the hour and half hour.

The accuracy of all the frequencies, radio and audio, as transmitted, is now better than a part in 50,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000001 second. The beginnings of the periods when the audio frequencies are resumed are synchronized with the basic time service of the U. S. Naval Observatory.

Preview of DX Contest 'Phone Scores

THE reason for that strange gargling noise we've been hearing on the 'phone bands the past few months can now be revealed — the 'phone session of the 14th ARRL DX Competition was to blame. And with the gaudy assortment of DX that showed up on both week-ends, no small wonder!

We have gathered together a list of the highest available scores, which will give you an idea of the new peak in activity reached in this annual feature. Several of the stations who were really knocking them off have not as yet been heard from, so this early report is by no means complete. Remember, too, there still remains the prodigious task of cross-checking all logs before scores can be announced as official.

On top of the pile we again find W2SAI, last year's 'phone winner. John has really proved his championship mettle this time, his log showing a total of 265,392 points, representing 582 contacts with stations in 84 different countries.

For second, W2AFQ and W3BES are very close to a dead heat in claimed voice scores — 141,840 and 141,642 respectively. Another wheeze by Mr. Mathis might have given him the nod. Four other scores over the hundred thousand mark also are available, these being the outstanding performances of W8KML, 135,509, W3NJE, 122,086, W3DHM, 118,560, W8BKP, 101,760.

The roster of other claimed scores over 40,000 includes: W2RGV 97,440, W8HUD 92,567, W9HEI 86,040, W8REU 82,251, W2BXA 80,840, W1JCX 83,325, W2ATE 75,272, W6TT 71,010, W3NC 68,252, W4DQH 64,347, W4LAY 60,861, W1CJH 60,378, W6EJC 57,285, W1BFB 56,072, W2RYT 55,675, W1ME 54,315, W9EWC 52,208, W6AED 50,589, W6MLY 47,424, W7ESK 46,992, W4EWY 46,170, W1KLE 44,625, W5BGP 43,845, W2AQW 43,677, W3FGB 43,092, W3FUV 42,408, W7HTB 41,535, W6IDY 41,184.

You'll note that many of these exponents of the spoken word also knocked themselves out in the c.w. fracas. For instance, W2BXA's impressive 'phone score was accompanied by a c.w. tally of 212,160 points, which was omitted in last month's radiotelegraph synopsis.

Reports from the overseas mob are lacking but we do have a pair of high Canadian boys, VE3HC with 68,816 points and VE1ET with 40,824 points.

You'd think that one of these brawls would be enough for the average person, but a listen over the bands right now will bring you that familiar phrase, oft repeated, ". . . but wait 'til next year!"

— *R.N.*

How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD/1

How:

This month we put on our long faces and again bring up for healthy discussion an exceedingly distasteful topic of the day. You've guessed it — *Hammus DXus Greedius*, or just plain DX Hogs. These critters have a great knack for making our bands seem narrower and more cluttered up than they really should be, not to mention the bad feelings they engender. We don't recall any previous serious attempt to catalog the species, so let's see if we can pin them down according to traits and habits, if only for the purpose of spotlighting them in the glare of their own obnoxiousness.

Type A: This louse is not above trying anything in or out of the books in order to get DX for his log (assuming he keeps one). Absolutely incorrigible, he has no scruples about purposely swinging a VFO-kw. while calling, taking the filter off the final for the rare ones, slipping out of the bands for same, exceeding the power limit, overmodulating to push through law-abiders, using a phony DX call with a CQ to see if he's really getting out, rigging up bogus veries, etc. Any morons using one or all of these stunts, plus others too numerous to mention, fall into this class. The required qualification is that the tricks be pulled *intentionally*. Fortunately, their number is small. And contrary to their own beliefs, we all know who most of them are.

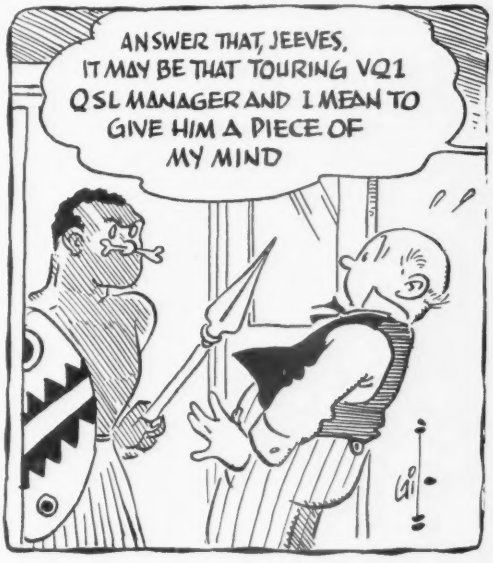
Type B: This cad is capable of anything in the Type A category. The only difference is that he has some semblance of a conscience. When the comeback percentage holds up, he's all sugar and cream and lily-white, but when the going is tough watch him start playing dirty. Then he'll try to alibi the bad taste out of our mouths afterward. The game would be a lot better off without jerks who qualify for either of these first two classifications.

Type C: This poor goof is often mistaken for Types A and B. He's a victim of his own carelessness and stupidity, but is still more to be censured than pitied. The joker is good at such brainless activities as calling DX at the wrong time or when zero-beat. If he can't raise that VR5 you'll probably hear him blow his top with either a CQ VR5 or CQ no VR5. Or he'll blandly scream CQ DX for several minutes, with persons trying to work a rare one on the same frequency. He'll also chat about the weather or run a long series of antenna tests with any rare DX station while the multitude stands by. A sloppy carelessness with absolutely no consideration for others is his trademark.

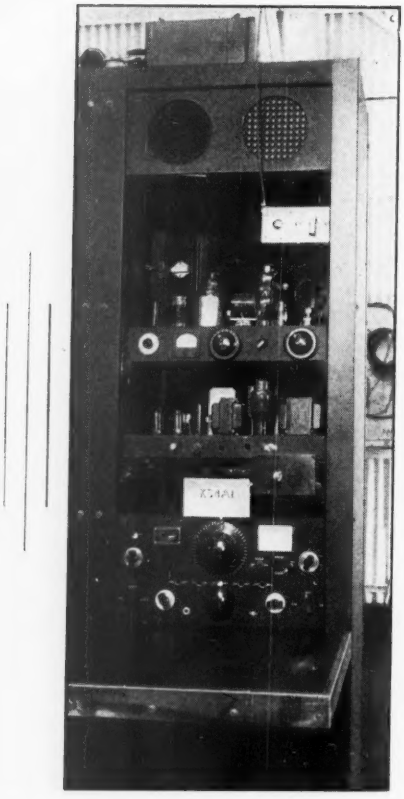
Type D: This fool often sounds like a candidate for the other types of Hogdom, but he may actually be a fine, clean-cut operator with otherwise high standards. His uncalled-for contribution to the art is a gosh-awful note. He operates day after day with a signal that should have gone out with spark. Key clicks, ripple, drift, chirpiness, A2 effects — these are the birds in whose faces you laugh when they begin to brag of their DX. Anyone who *couldn't* push a readable T6 signal through the T9x gang would have to be sending Japanese. He's often a punk engineer who wouldn't know a good note from a bad one, but you'll recognize guys in this class holding commercial tickets who are just too busy running up country totals to take any pride in their signals beyond the amount of noise they can make. You very frequently find Type D combined with Types A, B and C. And as long as FCC misses them they think they can indignantly thumb their collective noses at such criticism as this.

If all the vipers fitting the above specifications were laid end to end, we think DXing would be a much finer sport for all concerned. Certainly we would sound a lot less like a bunch of screwballs and more like the dignified bastion of Hamdom we Ws are supposed to represent.

All right, Jeeves. Lecture's over for today. Take the cotton out of your ears and dig up those DX notes. . . .



* DX Editor, *QST*.



The equipment shown here has been a harbinger of joy to many a DX hunter for the past year or so — operated under the call KS4AI on Swan Island by Ralph W. Bird, W5KWY. A long-wire antenna provided excellent all-band results with the 100-watt transmitter. Line-up: 6V6–807–push-pull 809s. KS4AI is now QRT so all correspondence to Ralph should go to his home QTH.

What:

Eighty: That ole debbil QRN is back, pinning the ears of the 3.5-Mc. gentry, after lying dormant for many months. The pride of Plaquemine, W5KC, nicked the band for a nice WAC, despite the rising static: J3AAD, HC1JB, FA8BG, KL7LE, HB9AW and ZL1MB. Vince is up to 157 worked now with 25 countries on 80 . _ . _ . _ In Montana, W7KVU also did the hat trick with his 150-watter on UAØKAA, CE3AG, G2JT, ZL1DI, ZS3D and VP7NG . _ . _ . _ W9AND needs Asia but accounted for KZ5FS, KZ5OJ, KZ5AX, XE1KE, CM2SW, KS4AI, KH6LF, W6ORT/KH6 and TI2KP . _ . _ . _ School keeps interfering with W4KVM's DX-factory business but Jim managed ZL1DI, F9KH, F8EO, OK1EA, FA8BG, TG9JK, ON4HC, LA1S, XF1A, GW5TW and some Gs . _ . _ . _ W4CVM, who probably gets tangled up with W4KVM at times, donates KH6NE, ZL2FA, FA8IH, XE1KE, PAØRE, KV4AA, ON4AU and G5TA . _ . _ . _ Still convalescing from an operation VE1EA operated on MD5KW, CT3AB, PAØOK, ON4JW, ON4QF, OK1MB, HB9DD, HB9FF, SM5BO, SM5FU, GW3ZV plus some Fs and Gs . _ . _ . _ A sturdy 815 at W3VZD snagged ON4AU, ON4HC, OK1LM, OK1MG, HB9AJ, F3MS, VO6R and ZS6DW . _ . _ . _ While his rig was torn down, WØUXQ tortured himself by hearing VR5PL, FM8AD, VK2RA, VK2CX, and sundry other rarities . _ . _ . _ Who has more than W4BRB's 45 3.5-Mc. countries?

Forty: Not quite ready for its summer slump, 7 Mc. still is evoking many delightful cries of joy. Giggling fiendishly, W9VES came out with KP6AA, LU5BM, VP9E, HP4Q, PY2AFS, VP7NG, EL3A, ZS1M and VR5IP . _ . _ . _ Thirty-six countries in just two weeks kept W8KPL busy. These included: **VP5MU** (7080), CM6ZK, KV4AA, PY7WS, SM5BX, **FM8AD** (7020), **HB9AW** (7030), **HB9U** (7050), I1MQ, I1AIV, VK3AEP, VK5JE, GI2HML and **J3AAD** (7040) for WAC on this band . _ . _ . _ Still short of Asia, W8YGR produced QSOs with **KP4HE** (7007), **FA8BG** (7010), **VO3Z** (7023), **SM4AGB** (7009) and **VE8NQ** (7071) . _ . _ . _ KH6PT blew up his power supply and was so disgusted he hooked a 90-volt B battery to a 1S4 crystal oscillator to see if he could scare up another KH6 local to tell his troubles to — but W6ZMU was there to answer his 1.62-watt CQ. W6ZMU had only 35 watts, so it looks as if the days of QRP aren't over yet!

Twenty: We again come to *the* band as far as DX is concerned. 'Nough said. A note from W6OBD starts us off on the right foot with **HE1EO** (14,130), **FT4AN** (14,000), **CR6AQ** (14,055), **VP6PX** (14,035), **VS4WL** (14,040), **FE8AB** (14,125), **GD2DF** (14,105), **XZ2EM** (14,025), **XZ2JB** (14,140), **UA1KEC** (14,130), UC2CB, **UB5KBD** (14,120), **UH8KAA** (14,070), **UA9CC** (14,180) and VQ3HJP. Lee has evidently worked them too fast to keep up his average, which is 95 veried out of 121 . _ . _ . _ A neat 'phone trick at W3UY was **YI1B** (14,312) . _ . _ . _ W7BE can sit back and relax (as if he will!) since he is now in for both DXCC and WAZ. His latest: **C8YR** (14,050) . _ . _ . _ The 809s and 3-element spinner at W6LRU clicked with **UC2AD** (14,050), **UR2KAA** (14,025), **UN1AA** (14,104), **EA1A** (14,130), **VU2BX** (14,012), **CN8BK** (14,000), **XZ2KN** (14,085), **MI6ZJ** (14,029), **YV1AZ** (14,095), **HP4Q** (14,050), **VR5PL** (14,012), **WØOZW/KS6** (14,029) for 101 postwar . _ . _ . _ On voice, W3QLW conversed with CT1IP, D4ABA, D4AQW, HH3DL, OX3BE, OX3GE, VO4Q, VP2GE, VP3LF, VP9Q and YV6AN . _ . _ . _ W8WWU did well with **VS9AN** (14,025), **HL1AE** (14,045), **XSV1KE** (14,025) and **CT1DK** (14,012) despite heavy whooping-cough QRM from the junior ops . _ . _ . _ W3LPF made it 100 even with GC2ASO but glooms about no QSLs from Latin American

countries . _ . _ . _ At W8ZBK we have **AP5B** (14,045), **VK6JB** (14,100), **LU1XK** (14,160), **VP4TZ** (14,120), **VK7KN** (14,100) and **EA1D** (14,075) . _ . _ . _ Transplanting himself from W3BUI to W2BUI necessitated starting all over again. Hal's first month produced 61 countries worked and 2 confirmed! . _ . _ . _ W4LWP's 25-watt 807 didn't shy away from CM1AU, KM6AA, CR6AI, CT1PP, VP5AK, HH3L, PK6SA, CE3BA, TI2BF, VP2AA, ZS1EJ, ZS6LW, OA4BR and a truckload of VKs including 9OU, 9RF and WØTKK/VK9. P.S.: The 807 was doubling! . _ . _ . _ W6ZCY kept one eye open and made off with VS9ET, CT3AB, ZC6NJ, CR6AQ, YS1V, YU7AF, CZ2AC and C8YR . _ . _ . _ CZ2AC was also snapped up by W5ASG, besides YU7KX, YU7LX, UAØFG, C6YZ and KM6AH. Then modulation did its stuff for Bill on W6YOT/C6, MD5PS, ST2FU, MI3ZJ, SV1RX, SV1WE, OH2QM, GC2RS, ET3AF, HA4AB, VR2AP and EA1FO . _ . _ . _ Ah, we finally come to a W9 who is working something. Namely, W9LNH, with VP5JT, VP1AA, VP9F, EK1AA, UI8AA, EL5A, ZB2A and CT1QF, the latter three on 'phone . _ . _ . _ "I could have done better with a beam," comments W5GEL after slaving for CR9AG, CN8MZ, UAØKFA, CR7VAL, VS1BA, WØMCF/C1, W2WMV/C9 and VS2AL, plus umpteen more. Not much better, we should think! . _ . _ . _ W3EVW conglomerated a nice 70-minute WAC with a YU7, ZS6QX, PY2AT, ZC6AC, VK5FL and VO6X. A kw. really pays off these days . _ . _ . _ OH2SJ/MM was hooked by W1MRQ while near Cadiz, Spain. Naturally, Ken needs EA badly. So near and yet so far! But W1MRQ got landlubbers CM9AB, an EK, HK3FF, ZD8B, OK1ZM, OZ9NH, PY1DS, ZS2EN, ZS6CZ and GI6WG.

Ten: Scram, Tilton. Goodman got here first. But evidently W1GOU wasn't far behind with EA7BA, VR6AA, CR7AD, PK2RK, AR8AB, ZC1AF, FF3JY, ST2FU, VU2GB, VQ4ASC, VQ4ERR and VK7AJ. These were all on A3 . _ . _ . _ W3QLW tried the key on CE3AG, GI6WG, GW3AHN, GW5BI, OQ5BU, ZS1BF, ZS1EB and ZS6OY . _ . _ . _ W7JLU made those squeaky noises in snatching LU2DS, LU5BM, KG6CP, ZL1MF and scads of VKs . _ . _ . _ W2SXV has 86 countries on the band using A3, boasting of a new wide-spaced 4-element mechanism . _ . _ . _ Also trying the microphone, W2GMM settled for VQ4HRP, VQ4GWB, GC2RS, ZE2JV, ST2CH, VP4TZ, HH1HB, HI6EC and YN1EP. Herb had to telegraph for FE8AB, CX4CZ and an FA8 . _ . _ . _ W2KZE tired of working Gs, so he QSOd HB9FY, UA3BJ, ZL1LZ, PAØIN, OZ7ON, LU5BM and SM5UU . _ . _ . _ From the heart of Alabammy, W4GLR ships us a huge list of successful snaffles. We choose a few: KH6KW, VQ3HGE, J2RLK, J2SJS, J2HYS, J2ACS, MD5GW, KG6CN, PZ1D, OA4AN, GD6IA, ZD4AH, OH2QM, VO6AD, GC2RS, XARC, VP5AS, HL1AN, HP1A, ZC1AF, CT1QA, CE7AF, ZB1S, LX1AI, OX3GE, HZ1AB, VQ2DH and KG6AW/VK9. Wow!

Eleven: Did you ever notice that on some days this band is open while ten, just a megacycle higher, is almost stone-dead? One of the more observant gentlemen, W9AND, has accumulated stuff on the order of EL5A, OX3GE, VO4T, KH6GT, KH6BI and CX1FB. Wes needs only Asia for a 27-Mc. WAC and W6ZZ reports working J9AAI. Who else has anything to say about this 270-kc. stretch of DX potentiality?

Where:

New catches are still getting on the air as attested to by the following list:

CP1JI	% American Embassy, La Paz, Bolivia
CR6AR	Box 147, Benguela, Angola
CZ2AC	Nicolo Teatro Ristori, 704 Malmedy Village, Monaco

Have a squint at W. H. Malcolm, G6WX, His Worship the Mayor of Coventry, England, in full robes of office. This photo accompanied the application of G6WX for 'phone DXCC.

EA1FO	(via ARRL)
EI3U	Dept. of Telecommunications, Institute of Science and Technology, Kevin St., Dublin, Eire
FK8AB	J. Duplat, Noumea, New Caledonia
I3AXC	Via Manzoni 20, Napoli, Italy
J2ANT	Navy 3923, FPO, San Francisco, Calif.
J4AAH	Flight Lt. S. L. Somer, Hq. BC Air, Iwakuni, Japan
J6DKU	(via W1DKU)
KG6AW/VK9	(to 2537 Hollins St., Baltimore, Md.)
KM6AH	% CAA, Midway
MB9AG	(via RSGB)
MD5PS	(via RSGB)
OH2DT	P.O. Box 12, Vaasa, Finland
ON4DN	Andenarde, Belgium
PK6XA	E. A. Krygsman, % NNGPM, Morotai, N.E.I.
ST2FU	(via RSGB)
VO6AF	APO 677, % PM, New York, N. Y.
VP2AG	APO 855, Miami, Florida
VP6HE	Cliftonville, Fontabelle, Barbados, B.W.I.
VP6LD	Laurie Dash, Marhill St., Bridgetown, Barbados, B.W.I.
VP6PX	Parochial Treasury, Christ Church, Barbados, B.W.I.
VP6SJ	Box 252, Bridgetown, Barbados, B.W.I.
VP7NG	Box 2003, Arlington, Va.
VP8AM	Randall P. Stanley, Falkland Islands
VQ3PYE	Box 568, Dar-es-Salaam, Tanganyika
VQ4HRP	H. R. Parnell, Box 1010, Nairobi, Kenya
VQ5PBD	Peter B. Dodd, P.O. Box 289, Kampala, Uganda
VR2AZ/VR1	Canton Island, Phœnix Group, Southwest Pacific
VR2BA	(via ARRL)
VR5AF	Box 25, Nukualofa, Tonga, South Pacific
VS7PS	Box 349, Colombo, Ceylon
VU2HS	(via G2HS)
W1CA/KP4	Hotel Normandie, San Juan, P.R.
W6UNE/KW6	(via W6TI)
W7JEF/KG6	Clark W. Cox, NAS Hobby Shop, Agana, Guam
W7LBX/KL7	P.O. Box 219, Anchorage, Alaska
WØSQS/Iwo	CAABC, APO 86, % PM, San Francisco, Calif.
XAMC	18th Signal Co., APO 209, U. S. Army, Trieste, % PM, N. Y. C.
YN1EP	153 AACS Sqdn., APO 3024, % PM, New Orleans, La.
YN2ACH	Fernando Chamorro, San Marcos, Nicaragua
YS1V	Guillermo Calderon, San Jacinto, San Salvador
ZC6MF	John Cox, APO, % 6th Airborne Division, Haifa, Palestine
ZK1AS	Raratonga, Cook Islands

Don't thank Jeeves. Thank W1s FTX, KQY, QMI; W2s AKX, JB, HAZ, RYT, WFZ, WZ; W3s GA, LTW, OP; W4KFC; W5s ASG, DTJ, LKH; W6s CG, OJW, VAW, WNI, WSS, ZZ; W8s AL, GG; W9CIA; WØs CFB, WVS/5; HB9J; VR5PL.

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On page 39 of May *QST* is a clarification of the ARRL QSL Bureau policy. The familiar words "QSL via ARRL" should only be used by W/VE stations. Under ordinary circumstances, cards for foreign amateurs should be sent direct to the bureaus representing each respective country — *except* in the cases where stations are operating "under cover." The ARRL will accept cards to and from these stations.

Tidbits:

Statistics from G8PP may knock the QSL halo off the heads of many Ws. Les has QSLd 1300 stations worked and claims the following returns: W1, 100%; W2, 59%; W3, 81%; W4, 50%; W5, 66%; W6, 55%; W7, 80%; W8, 60%; W9, 55%; WØ, 100%. Among the shortages are undoubtedly many lads who moan loudly when their cards to rare DX go unanswered for a while and yet who are neglectful in answering cards themselves. Les further compliments the ZL and ZS gang on their high average of confirmations . . . . . VS2CC was on the air but a few weeks before shipping back to England for a 6-month leave. There he operated as G3CYE. He'll be back in Kuala Lumpur soon again as VS2CC with 25 watts and an HRO . . . . . KP4FJ is having a rough time landing Idaho and Montana for his WAS (28 Mc.) while HK3AB would be satisfied to set up a schedule with stations in the vicinity of Norwich, Conn., on the same band . . . . . VP6CDI and VR5IP warn that they'd like to be called at *only* the proper times or they'll close their W files entirely . . . . . W6ODD reports that ZD1WB's *QST* QTH resulted in a boomerang — anybody get the lowdown on this station? . . . . . W7EYS states that terrific winds in most of W7 made many beams quite unmanageable in the Contest, accounting for lowered scores in that area. Another argument for the underground antenna! [I've got the ditch all dug for ours, boss. How about throwing your haywire rig in with it? — *Jeeves.*] Quiet, Jeeves. You'd look pretty funny operating like a scared ostrich . . . . . D4AUU isn't Scotch, but he winces when he sees so many W QSLs with up to 25¢ postage on them. A penny will do, advises W3DEJ . . . . . Anybody wanting a W7QB/KL7 card should try Wes' home QTH. He's back home and wants to clear up the books . . . . . KH6LF may be found on the low edge of 80 searching high and low for New England WAS contacts — 100% QSL . . . . . **YU7UU** (13,998) advised W9GMV that he will QSL all stations in

(Continued on page 114)

♦

Here are two prominent DXers who are almost a world apart — ordinarily. At the left is no other than W5ALA, ARRL West Gulf Division alternate director. Being entertained in Jack's shack is PAØUM who stopped in for a visit while on his way to PK. W5ALA can be heard holding his own on 14-Mc. 'phone whenever the band is open for DX. Watch for PAØUM from his new N.E.I. location.

Surplus Corner

A "Q5-er" for BC-348 Owners

THE "Q5-er" and the "Lazy Man's Q5-er" described in recent issues of *QST* [1] have really come into their own. The increased selectivity gained by utilizing an i.f. channel of 85 kc. has been used by many with excellent results. Both of the Q5-er units described to date, however, will work only with receivers having i.f. channels in the 456-kc. range. Here are four methods that enable the BC-453 (the 190–550 kc. ARC-5 receivers) to be used with the BC–348, a receiver having a 915-kc. i.f. — *Ed.*

. . . by Adding Series Padders

THE use of the BC-453-B as an outrigger i.f. with the BC-348 presents a few problems occasioned by the fact that the 453 tunes only the range 190–550 kc. while the BC-348 has an i.f. in the neighborhood of 915 kc. The following modification of the BC-453-B to make it tune to 915 kc. has worked out very well.

The slugs in the antenna, r.f., and oscillator coils were removed. This can be done easily after unplugging the coil strip. The stator leads from the antenna and the mixer sections of the tuning gang were clipped and a 150-$\mu\mu$fd. mica trimmer was inserted in each lead. By using heavy wires to support the trimmers, good mechanical stability was attained. The main padder condensers (two fixed micas, total 670 $\mu\mu$fd.) were removed. This put the desired 915 kc. within the range of the auxiliary padder and trimmers on the main condenser gang.

Coupling to the BC-348 is made to the second detector by wrapping a piece of wire (insulated) around the detector diode prong on the tube and leading the wire through a small hole drilled in the front panel of the 348. This is more convenient than making the lead come in from the side where it would interfere with servicing or aligning the 348.

Although this set-up works very well, it can be improved by the addition of a.v.c. to the BC-453. The unused diode of the 453's second detector is lifted from ground and a 2-megohm resistor is inserted. The high end of this resistor is connected, through 310,000 ohms, to a wire that is carried through a hole in the chassis and into the a.v.c.-m.v.c. switch of the BC-348. Here the switch is revised so that the a.v.c. voltage of either the 348 or the 453 may be used at will. This may not be the best method, but it is simple and involves very little "messing" with the 348. Incidentally, one might as well yank out the output tube in the 348, because after you use the outrigger i.f. you won't go back to the original. — *G. M. Kosolapoff*

[1] "The Q5-er," Rand, *QST*, December, 1947, p. 18; Technical Topics, B.G., "The Lazy Man's Q5-er," *QST*, Jan., 1948, p. 40.

. . . Building a Simple Converter

TO me, the obvious solution was to build a simple converter that would accept the 915-kc. i.f. signal of the 348 and change it to some frequency that is within the tuning range of the BC-453. Such a converter, utilizing a 12K8 as a combined mixer-oscillator and standard 456-kc. broadcast-receiver coils (available as replacement items in almost any store), was built on a standard $3 \times 4 \times 5$-inch utility box. Mica trimmers, adjustable through grommeted holes in the side of the box and having a maximum capacitance of 200 $\mu\mu$fd., were used to tune the mixer and oscillator coils. Other components, and the circuit, were those employed in the converter portion of the receiver described recently in *QST* [2] and in the 1948 *Radio Amateur's Handbook*. Power for the converter was furnished by the same supply used with the BC-453, the 24 volts a.c. being dropped to the 12-volt requirement of the 12K8 with a suitable resistor.

Because of the relatively low frequencies involved, no particular precautions were necessary in parts layout and wiring, other than the careful shielding of the lead that couples the output of the 348 to the input of the converter. No bugs or spurious responses were encountered, and performance of the "Q5-er" has been all that is claimed for it by other users.

No attempt was made to build the converter into the dynamotor shelf of the 348, or of the 453, because its chassis is so small that it takes very little room on the operating table. There is no reason why a 6K8 or other 6.3-volt converter tube could not be used with equal success. The 12K8 was used merely because it was on hand. — *William W. Orr, W20WA*

. . . Modifying the Coils

THE tuning range of the BC-453 may be altered to cover the 915-kc. i.f. frequency of the BC-348 by the following method. Take off the coil-shield assembly, and remove about half of the turns on

[2] "An Amateur-Band 8-Tube Receiver," Goodman, *QST*, August, 1946, p. 13.

the r.f. and mixer coils. (They will measure about ¾-inch diameter when enough turns have been removed.) Take off about the same number of turns on the oscillator coil. Loosen the coil slugs by melting the wax, and tune with the condenser gang until a broadcast station near 915 kc. can be heard on the 453. By use of the slugs, the main tuning-condenser gang, and the trimmers, this should be "duck soup" for the average ham. Since the 453 has to work only on 915 kc., no tracking problem is involved. If, however, you care to take the trouble to trim the coils until accurate tracking is achieved across the entire new tuning range of the 453, a nice spare b.c. receiver will be the result. For those fortunate souls who possess a signal generator, this should be a lot easier.

With the 453 working on 915 kc., remove the second-detector tube in the BC-348 and wrap a wire around the diode plate prong. Replace the tube in the 348, and rock the tuning condenser of the 453 until the signals come rolling through. In cases where a strong local broadcast station occupies 915 kc., the lead from the 348 i.f. output to the 453 input should be shielded. For peak performance, the trimmers on the top of the 453 can be tuned for maximum signal.

For added refinements, I found that the r.f. stage in the 453 doesn't add anything to the complete set-up other than noise. That stage was made inoperative by removing its coil. Coupling from the 348 was then made directly into the mixer of the 453 by placing a wire near the exposed grid lead of the mixer tube. The coupling should be very loose for best results. Since the 453 is for added selectivity only, it should be fairly obvious that the r.f. stage is not necessary.

I also find that the high level of b.f.o. hiss can be reduced considerably by placing a 3000-ohm resistor as a bleeder from the B-plus side of the b.f.o. transformer to ground. This is about the only way the b.f.o. plate voltage can be reduced, because the skimpy amount of current drawn makes the use of series dropping resistors futile. — *Marv Gonsior, W6VFR*

. . . Converting with an External Oscillator

THE 915-kc. i.f. output of the BC-348 may be converted to a lower frequency by beating it against the signal from a separate crystal oscillator of suitable frequency. The two then can be mixed in the input of the BC-453 to take advantage of the 85-kc. i.f. channel in that unit. This was accomplished using the circuit shown in Fig. 1, and the results compare favorably with the sensitivity obtained with the original "Q5-er" [1] and a BC-312. The oscillator and the control circuits for the BC-453 were mounted on a small bracket and panel attached to the side of the "Q5-er" as shown in the photograph.

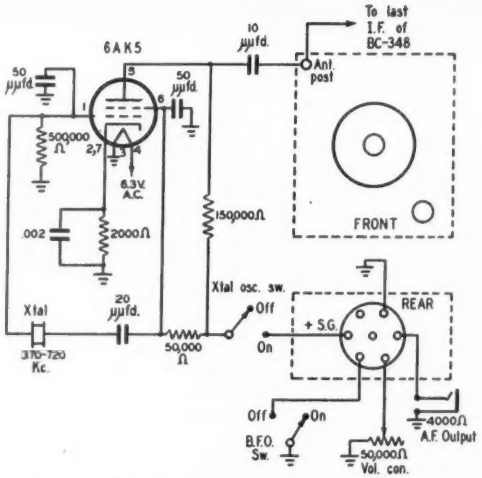
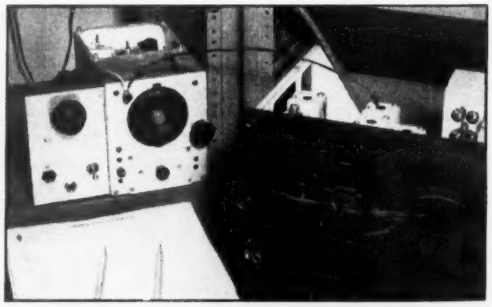


Fig. 1 — **Circuit diagram of a crystal-controlled oscillator used to beat with the i.f. output of the BC-348 to produce a signal in the tuning range of the "Q5-er."**

The choice of the crystal frequency is not critical, as long as it will produce a beat that is within the tuning range of the BC-453. Do not, however, choose a frequency that will produce a beat within 20 kc. of one-half of the i.f. frequency of the BC-348, as then all you will hear will be a steady signal from the crystal. It is well to pick out a clear spot on the dial of the BC-453, and then get a crystal to suit.

Almost any crystal will work well in the circuit shown. It is an adaptation from the circuit used in crystal-calibrator units. I used 470 kc. as the crystal frequency, which when subtracted from the i.f. frequency of the 348, produces a beat at 445 kc. That is about as close as you should come to the actual crystal frequency.

No changes were made to the BC-453, except to tap the B-plus lead for the crystal oscillator onto the screen-voltage connection at the rear socket as shown in the diagram. Oscillator voltage is fed to the antenna post of the 453 through



The crystal-oscillator stage is mounted alongside of the "Q5-er" on a small panel that also contains the b.f.o. switch, the gain control, and the 'phone jack. The method of coupling to the BC-348 is also shown.

a 10-$\mu\mu$fd. condenser. Satisfactory mixing in the front end of the 453 was obtained with this value.

Coupling from the i.f. channel of the 348 to the 453 was made by shoving an insulated wire down inside the last i.f. transformer shield.

If desired, a self-excited oscillator may be used instead of the crystal-controlled unit described, in which case the beat frequency may be moved to almost any convenient point in the range of the 453.

Last but not least, be sure that the plungers in the i.f. transformers of the 453 are pulled all the way out to get maximum selectivity. — *Philip S. Rand, W1DBM*

ARC-5 Transmitter Modifications

From several sources we have received information on various modifications that can be made to the BC-457 and BC-459 transmitters to improve their usefulness in the ham bands. Space does not permit inclusion of all contributions, but the following have been selected as being representative of the more important changes. — *Ed.*

Improved Keying

Quite a few of the users of the "Command" transmitters seem to be experiencing keying troubles, as evidenced by the unusual number of Official Observer notices I've had to mail during recent weeks. The responses to these cards seem to indicate that the best way to avoid trouble is to key the oscillator plate and the amplifier screen simultaneously from a source of 200 to 300 volts. This should be accomplished by means of a relay to remove the hazard of having high-voltage on the key. The 0.05-μfd. condenser that is connected from the oscillator plate to ground also has caused keying troubles. Its value may be reduced to 0.002 μfd. — *T. A. Previtt, W9UKT*

14-Mc. Output from the BC-459-A

The BC-459-A, originally designed for output in the 7-Mc. range, may be used to provide output in the 14-Mc. band with slight modification of the *LC* circuit in the amplifier stage.

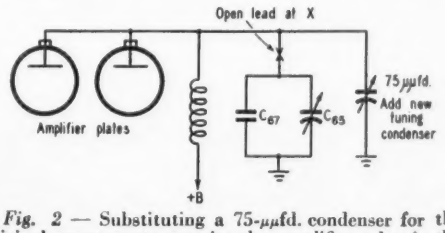


Fig. 2 — Substituting a 75-$\mu\mu$fd. condenser for the original components permits the amplifier tubes in the BC-459-A to work as doublers to 14 Mc.

Fig. 2 shows one method by which this may be accomplished. The original condensers, C_{67} and C_{65}, are cut loose from the coil, and a 75-$\mu\mu$fd. variable is substituted in their place. This, of course, will not be ganged to the oscillator tuning condenser, but it can be resonated separately without undue inconvenience. — *John T. McIntosh, W8ZGO*

It is possible to obtain 14-Mc. output from the BC-459-A and at the same time retain the gang-tuning feature. Amplifier padding condenser C_{67} (the one with the locked shaft) is removed, and ten rotor plates are removed from the other main tuning condenser. The plate coil is then pruned down to 5½ turns, and the tuning slug is removed. A 35-$\mu\mu$fd. padder is substituted for C_{67}, mounted with its shaft projecting through the side of the chassis. Plate-circuit tracking is then adjusted by means of the new padder condenser and the top turn on the coil. The position of this turn can be adjusted to bring the tracking error to a minimum.

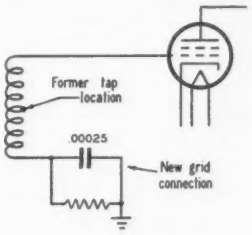


Fig. 3 — The revised grid circuit used when the BC-459-A is used for 14-Mc. output.

To obtain greater r.f. voltage for the final amplifier (to increase its doubling efficiency), the tap at which the grid leak R_{74} and the grid by-pass condenser are connected is moved down to the bottom of the coil as shown in Fig. 3. The value of the grid by-pass condenser, C_{58e}, is changed to 0.00025 μfd. from the 0.05-μfd. value originally in the circuit. This change was necessary to reduce the amount of chirp encountered in keying. The fixed neutralizing condenser, C_{62}, that was connected from the cold end of the grid coil to the plate circuit was removed, as it is no longer needed. — *W1DX*

Making Use of the Tuning Eye

The BC-457 and BC-459 transmitters were designed to work from a 24-volt d.c. supply. Under these conditions, the 1000-ohm resistor between the 24-volt d.c. line and the cathode of the "magic-eye" tube develops the correct bias for proper operation of the tube in conjunction with the built-in crystal calibrator.

Most hams revise things so that the filament circuits operate from a 24-volt a.c. source. With a.c., the magic eye will not react. This can be corrected easily, however, by the following

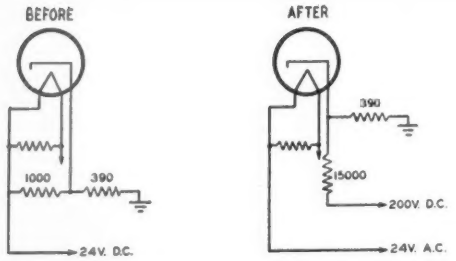


Fig. 4 — **Simple change required to permit use of the tuning eye when a.c. is used on the filaments of an ARC-5 transmitter.**

method. The 1000-ohm resistor is removed from the cathode circuit of the magic-eye tube, and a 15,000-ohm 2-watt resistor is connected between the cathode and the B-plus line as shown in Fig. 4. (This assumes that the oscillator and the screen grids of the amplifier are being supplied from a 200-volt source.) With this small change the resonance indicator will give a very clear and definite shadow when the oscillator is tuned through the crystal frequency. Note that the 390-ohm resistor that is connected from cathode to ground is left in its original position. — *F. W. Wright, jr., W2UWK*

Eliminating Ripple in the BC-459-A

A T7 note in my BC-459-A was cured by the following method: The larger heater-voltage equalizing resistor, R_{71} (mounted on the inside rear edge of the chassis), was removed from the circuit by clipping the leads and soldering them together. This disables the magic-eye tube, but calibration can still be accomplished by tuning the oscillator to 7.5 Mc. and listening to the beat note between its second harmonic and the 15-Mc. signal from WWV.

Keying was accomplished in the negative lead from the 400-volt power supply used to power the whole rig, suitable dropping resistors having first been installed in the oscillator-plate and amplifier-screen leads. This method eliminated the chirp that had been present when cathode keying was attempted. — *J. R. Abbott, W6ZOL*

N.F.M. Added to the BC-459-A

IF you are using a 40-meter ARC-5 transmitter (BC-459-A) as the VFO in your 28-Mc. 'phone rig, don't overlook this simple method of using it also as a narrow-band f.m. exciter. All that you need is the ARC-5, your present speech amplifier (assuming that its output transformer has a 500-ohm tap on its secondary), and a 0.05-μfd. paper condenser.

The connections are made as shown in Fig. 5. The audio voltage is fed to the grids of the amplifier tubes in the BC-459-A through Pin 2 on the 7-pin power connector. (They are already connected to this pin in most units.) The effect of the fluctuating bias produced under modulation is to vary the frequency of the oscillator slightly. Not much power is required, and any amplifier capable of delivering between 3 and 8 watts should do the job. The setting of the audio gain control can be determined by trial. Too much audio will cause distortion and fluctuation in the meters. The proper setting can be determined by testing with other stations. Some have called this grid modulation, but tests made with an oscilloscope prove it to be f.m. While some a.m. is present at the output of the

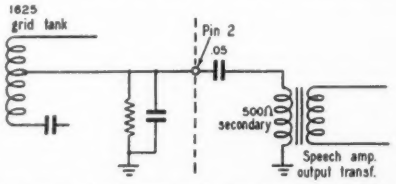


Fig. 5 — **A simple method of using the BC-459-A as an exciter for n.f.m. work.**

BC-459-A, the action of the following doubler stages, operating Class C, washes out the a.m. leaving only f.m.

Reports obtained with this set-up on the air have been excellent. The audio level is high, and the signal is easy to tune. It makes a swell addition to any station, especially where BCI problems have been encountered. — *Don Imhoff, W8YFS*

Strays

Growing out of a chance 10-meter rag-chew between W. J. Erich, W6AL, and Brian Hebert, G2WI, the International Amateur Radio Fellowship Organization now is well on the way to shipping its thousandth food parcel to needy folks in Great Britain and other countries. To date, support for the organization has come from amateurs in four continents and most U. S. call areas. Details of the workings of this worthy endeavor, which has earned wide commendation for our hobby in the press here and abroad, can be obtained from W. J. Erich, W6AL, Route 2, Box 501, Lodi, Calif. or William E. Nelson, W6RQL, Middletown, Calif.

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As if working each other wasn't coincidence enough, W6ND and W6DN compared notes and discovered that besides being licensed the same year, they were the same age to a day!

Fourteenth ARRL Sweepstakes Results

Biggest SS Yet — All Scoring and QSO Records Shattered

EACH major ARRL operating contest, it seems, provides the opportunity to report broken records of one sort or another. Those of us at ARRL headquarters who are concerned with the task of compiling such statistics have come to accept it as a foregone conclusion that each succeeding competition must inevitably result in increased participation and higher scores. But even our hard-boiled contest-checking personnel were somewhat overwhelmed by the number of broken score and contact records made in the Fourteenth Annual ARRL Sweepstakes Contest, held last November 15th–16th and 22nd–23rd. Broken records were "a dime a dozen," compared to any previous all-section type operating competition.

W6MLY, highest 'phone scorer, Santa Clara Valley Section winner.

Participation in the 1947 SS set an all-time high. There were 1625 entries, 1282 from c.w. contestants and 343 from 'phone. Logs were received from all ARRL sections but the Philippines.

All previous score records were smashed by exceedingly wide margins. In past events, a c.w. total in excess of 100,000 points was a notable achievement. In the Eleventh SS (1940) for example, three operators topped that mark; the Twelfth brought eight such scores; the Thirteenth (1946) saw eighteen operators in the six-digit category. In this contest we find no less than fifty-three operators in the hundred-thousand class! 'Phone scores were likewise much higher than ever. In 1946 eight voice operators made scores above 30,000 points. Thirty-five entrants topped that figure in this SS!

Winners

As in other ARRL all-section contests, competition for awards in the Sweepstakes is only within individual ARRL sections. All 71 of the League's sections were active in this contest. Attractive bronze medallions, engraved with the winner's call, are being awarded to 70 c.w. operators and 68 'phone operators. The winners are those first listed in each ARRL section under the heading "Scores." It took plenty of operating ability to place on top in this SS and we heartily congratulate all those who qualified for the medallion awards.

High C.W. Scorers

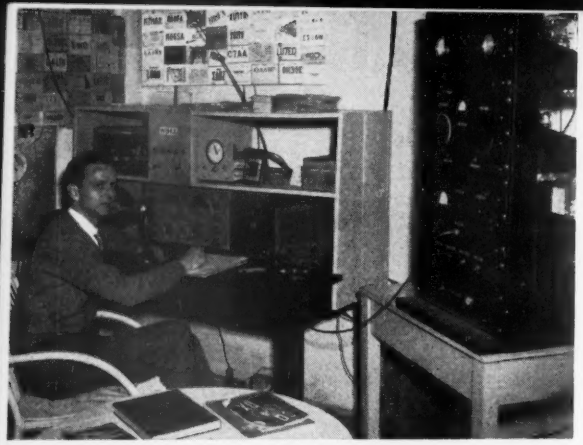
What is the maximum score attainable in an SS contest? We hesitate to venture an answer, but it would appear that Vic Clark, W4KFC, came pretty close to the saturation point in the 1947 fray. A score of 156,750 points, obtained through contacts with 923 different stations in 68 sections, makes him the undisputed 1947 SS leader and all-time SS record holder. Vic's contact total figures out to 23.1 QSOs/hour, which is a record that will not easily be topped in subsequent contests. A 3.5-Mc. half-wave end-fed antenna, also used on 7 Mc., and folded doublets for 14 and 28 Mc., combined with a VFO-controlled transmitter ending up in a 257-B amplifier running 100 watts input enabled W4KFC to scoot around the bands with maximum ease. The receiving end was taken care of by an NC-100, two BC-348s and a Gon-Set 28-Mc. converter.

In the "place" position we find Larry LeKashman, W2IOP, who made a clean sweep of all 71 sections. His 882 contacts netted a score just a "nose" behind W4KFC — 156,555 points. The SS transmitter at Larry's shack consisted of a VFO driving a 4D32 or 4-65, depending on the band used. Receiving was done on a Collins 75A.

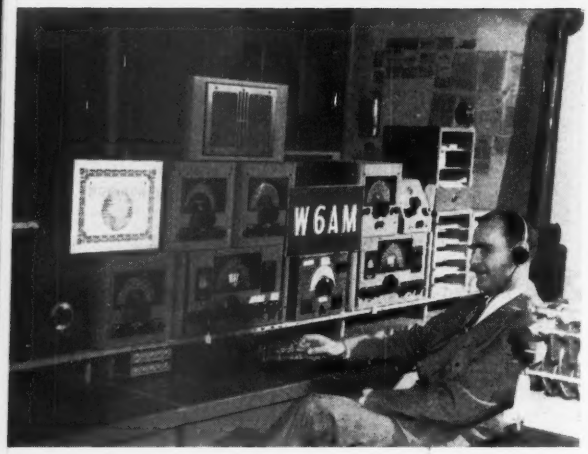
The "show" position was snared by W6HZT with 893 contacts, 70 sections and 155,488 points. Credit for this score goes to Cameron Pierce, W6HJT, operator at W6HZT during the SS.

Here are the remaining fifty c.w. scores over 100,000: W3BES 147,700, W9RQM 141,795, W9FOI 138,345, W6LDJ 137,568, W4KVX 131,655, W5LGG 130,463, W8WZ 130,288, W9TWC/8 129,720, W3GAU 127,800, W9ERU 125,960, W9VSO 123,752, W6AOA 122,648, W1RY 121,958, W2SSC 116,790, W3BXE 116,115, W8ROX 116,025, W7FZA 115,834, W4LOI

W8WZ, Ohio c.w. winner.



Above: W8HUD, Michigan 'phone winner, all sections worked. *Below:* W9RQM, Wisconsin c.w. winner.



Above: W6AM, second high 'phone scorer, Los Angeles winner. *Below:* KL7NA, Alaska c.w. winner.

114,972, W5KC 114,540, W9FJB 114,240, W3GHM 113,398, W3FQZ 111,840, W2PGT 111,555, W8UWM 111,178, W9CYU 108,800, W2PWP 108,675, W2AYJ 108,150, WØYCR 107,669, W2CZO 107,640, WØJNC 106,930, W5LW 106,750, W9GRV 106,250, W2QCM 105,543, W1BIH 105,225, W1VDY 105,105, W9VES 105,060, W9WFS 103,673, WØDYX 103,673, WØDNW 103,515, W3KT 103,360, W9DUY 103,155, W2JAG 102,938, W9NII 102,680, W3DPA 102,510, W2SAI 102,255, W2HEH 101,600, W3JTC 101,400, W8RCN 101,238, W1LWA 100,800, W4KFT 100,750.

In Canada the highest-scoring contestant was VE3KE, with 567 contacts, 68 sections and 96,050 points. VE7ZM scored 85,818 from 505 QSOs with 69 sections. Third-place Canadian was VE6AO, who worked 585 stations in 66 sections for 75,372 points. Other high VE scores: VE3EF 75,040, VE3EK 74,370, VE1TR 70,784, VE7ALE 65,650, VE3GT 61,840, VE3AEM 59,875, VE3AGX 55,957, VE7EH 52,416, VE3AHV 52,227, VE1KJ 51,910, VE3JJ 50,530, VE5MQ 50,111.

In the previous contest there were ten stations in the over-700 contacts class. This SS saw ten operators topping 800 QSOs and eleven with contact totals over 700. As has already been mentioned, W4KFC set a new SS record by working 923 different stations. Next in line we find W6HZT 893, W2IOP 882, W4LOI 868, W9FOI 862, W3BES 844, W9RQM 826, W9FJB 817, WØYCR 810, W6LDJ 802, W4KVX 786, W9ERU 753, W9TWC/8 752, W5LGG 749, W8WZ 747, W8ROX 720, WØLLN 716, W6AOA 711, W2SSC 709, W1RY 708, W7ONG 703.

Leaders in Sections Worked

Following 1946 pattern, the distinction of having worked all sections was shared equally between 'phone and c.w. participants. W8BKP and W8HUD on 'phone, W2IOP and W6MUR on c.w., worked all 71 sections. The Philippines section was missed by numerous other contestants. The following each worked 70 sections: *C.W.* — W1OJM, W2AYJ, W2CWE, W2FBA, W2PWP, W3BES, W3BVN, W4BRB, W5LGG, W5LW, W5NIW, W6EPZ, W6GWW, W6HZT, W6MVQ, W6NNV, W6WIP, W7ONG, W8BWC, W8JM, W8WZ, W9FJB, W9VFZ. *'Phone* — W5LRE, W8BWC, W9NDA, W9RBI.

Leading 'Phones

The West Coast walked away with top honors in the SS 'phone competition. Californian W6MLY took advantage of the low-power multiplier, chalked up the highest total, 65,540 points, through contacts with 383 stations and 69 sections. W6AM was a close second with 63,717 points, 477 contacts, 67 sections. Don worked more stations than the leader, but he was edged out in the scoring by W6MLY's multiplier.

CLUB SCORES

Club	*Score*	*C.W. Winner*	*'Phone Winner*
Frankford Radio Club (Phila.)	2,670,877	W3BES	W3DHM
Bloomfield Radio Club (N.J.)	1,438,628	W2CLO	
Potomac Valley Radio Club	1,149,780	W4KFC	
Cleveland Brass Pounders Assn.	700,824	W9TWC/8	
Washington Radio Club (Wash., D.C.)	659,985	W3FQZ	
San Antonio Radio Club	625,657	W5LGG	
North Suburban Radio Club	603,156	W9FJB	W9CMC
Northern California DX Club	601,837	W6TT	W6IKQ
El-Ray Radio Club	555,033	W1VDY	W1PKV
Milwaukee Radio Amateurs' Club (Wis.)	504,539	W9VSO	W9PTE
Greater Cincinnati Amateur Radio Assn.	492,053	W4KVX	W8TRX
K B T Radio Club (N.Y.)	309,675	W2SYT	
Concord Brass Pounders	299,017	W1BFT	W1BFT
Wisconsin Valley Radio Assn.	297,462	W9RQM	W9QIX
Detroit Amateur Radio Assn.	293,091	W8SCW	
West Side Radio Club (Ont.)	260,175	VE3AEM	
Delaware Amateur Radio Club	256,831	W3DPA	
Calgary Amateur Radio Assn.	247,828	VE6AO	VE6FK
Queens Radio Amateurs	245,831	W2KPA	
Metropolitan Club of L. A. (Calif.)	244,770	W6AOA	
Kanawha Valley Amateur Radio Assn.	237,115	W8PQQ	
Dade Radio Club (Fla.)	216,525	W4GOG	
Cahokia Amateur Radio Club (Ill.)	211,250	W9FOI	
West Palm Beach Radio Club (Fla.)	210,893	W4BRB	
Mountaineer Amateur Radio Assn. (W.Va.)	205,063	W8RCN	
Jersey Shore Amateur Radio Assn.	194,905	W2LJR	
Egyptian Radio Club (Ill.)	190,302	WØLLN	
Syracuse Amateur Radio Club (N.Y.)	188,390	W2PGT	
Northwest Amateur Radio Club	186,978	W9NII	W9BDV
Sioux City Amateur Radio Club (Iowa)	179,737	WØEQN	
Kickapoo Radio Operators (Ill.)	177,688	W9AMP	
Motor City Radio Club	164,675	W8YDR	
Northern New Jersey Radio Assn.	164,059	W2BBK	W2MLM
Cuyahoga Radio Club	144,420	W8UJ	
Wesco Amateur Radio Society (Penn.)	137,818	W3NJH	W3KQU
Black Hills Amateur Radio Club (S. Dak.)	133,821	WØYEZ	WØIWE
Columbus (Ohio) Amateur Radio Assn.	132,579	W8LFE	
Hamfesters Radio Club	129,080	W9WEN	
San Mateo County Amateur Radio Club (Calif.)	124,736	W6PBV	W6MLY
Shy-Wy Radio Club (Wyo.)	124,471	W7HRM	
West Seattle Amateur Radio Club	120,729	W7GUI	
Conn. Wireless Assn.	118,522	W1FTX	
Monmouth County Amateur Radio Assn. (N.J.)	112,003	W2OOC	
Delaware Lehigh Amateur Radio Club	110,114	W3NF/2	
Manchester Radio Club (Conn.)	109,372	W1NMP	
Toledo Radio Club (Ohio)	108,024	W8TKS	
Buckeye Shortwave Radio Assn. (Ohio)	104,257	W8OYI	
South Lyme Beer, Chowder and Propagation Society	100,185	W1VG	
Worcester County Radio Assn. (Mass.)	96,216	W1KJO	
Associated Radio Amateurs of Long Beach (Calif.)	89,729		W6AM
Case Institute of Technology Radio Club	79,562	W8YPT	
Hi-Q Radio Club (Mass.)	75,155	W1BSG	
Tri-Town Radio Club (Ill.)	74,607	W9TAL	
Inter-City Amateur Radio Club (N.J.)	74,600	W8TAJ	
New Haven Amateur Radio Assn. (Conn.)	73,483	W1QJM	
Park Way Radio Assn. (Mass.)	72,453	W1LYL	
Horseshoe Radio Club (Penna.)	69,866	W3KQD	
Tri-County Radio Assn. (N.J.)	57,854		W2RVC
Narragansett Assn. of Amateur Radio Operators	50,992		W1BIB
Pittsfield Radio Club (Mass.)	46,355	W1BKG	
Michiana Amateur Radio Club (Ind.)	45,388		W9KYM
Baltimore Amateur Radio Comm. Society	43,834		W3FUV
Toronto Amateur Radio Club	35,056	VE3AVN	
Pasadena Short Wave Club (Calif.)	32,410		W6YQQ
British Columbia Amateur Radio Club	23,997	VE7ACS	
Mon-Yough Amateur Transmitters Assn. (Pa.)	22,660	W3KUY	
ECO Net Radio Club (Mich.)	21,054	W8SWA	

W6OGZ, fourth in last year's contest, moved up to third this year — 62,846, 471 contacts, 67 sections.

Also worthy of special mention was W6QEU's fourth-place score of 60,375 (353 contacts, 69 sections). Additional outstanding scorers: W9NDA 57,820, W2NSD 57,052, W6HAN 59,400, W9RBI 54,950, W4YNQ 54,805, W8HUD 52,966, W6CHV 44,370, W9RNM 43,112, W9KYM 40,732, W2TUK 40,078, W2RVC 38,464, W4JYB 38,464, W5KAC 38,400, WØOMG 38,080, W1ATE 37,672, W6IKQ 36,918, W1BIB 36,696, W2EGG 35,979, WØGZD 35,100, W7KRM 44,880, W9QIX 32,886, W3DHM 32,572, W8TRX 32,488, W4AQR 32,160, W3FUV 31,850, W8SDD 31,626, W2JKH 31,490, W8BKP 31,240, W5FH 30,954, WØRQK 30,656, W8PXP 30,132.

W6AM with 477, W6HAN with 455, and W2NSD with 421 contacts topped all previous stations-worked records. Other leaders were

(Continued on page 118)

VE3KE, highest-scoring Canadian, Ontario c.w. winner.

Hints and Kinks For the Experimenter

CLEARING JAMMED PULLEYS

ONE of my antenna pulleys had gotten gummed up or rusty and was becoming hard to operate. The pulley was at the top of a 42-foot mast that could not be lowered or climbed. Here's a hint to others faced with the same unhappy problem.

I folded a piece of waxed paper diagonally a couple of times, forming a triangular sack. I then poured several ounces of heavy motor oil in the sack, gathered the top together with string, and lashed the whole sack to a point on the antenna halyard that I knew I could pull through the pulley. The halyard was then pulled until the sack was four or five inches from the pulley, as shown in Fig. 1. A quick yank on the halyard then smashed the paper sack, causing the oil to drench the pulley block thoroughly, giving it the bath that it needed to clear up the trouble.

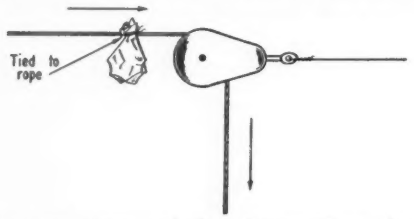


Fig. 1 — A clever method of oiling a pulley at the top of an antenna mast. A breakable sack is made of wax paper and is then filled with oil. It is smashed against the pulley block with a quick yank, drenching the block with the oil.

— Robert E. Barr, W5GHF

NEUTRALIZING THE 813

AFTER many hours of trying in vain to neutralize a pair of 813s by conventional methods and never knowing whether I had too much or too little capacity, I finally decided to try inductive neutralization. A one-turn link was wound around the center of the grid coil with "bell" wire and brought over to the center of the plate coil with 70-ohm Twin-Lead where another one-turn link was constructed. With grid drive on and plate power off, the final grid and plate tanks were tuned to resonance. A 60-ma. bulb coupled to the plate tank almost burned out. The swinging link neutralizer was then slowly pushed into the center of the plate tank, and the bulb grew brighter so the 70-ohm Twin-Lead connections to the link were reversed and presto, the bulb grew dimmer. The swinging link was pushed in a little at a time until the 60-ma. bulb went out completely even though it was tightly coupled to the plate tank. The whole operation from start to finish took only a few minutes. With 700 watts input and 100% modulation, the 813s were really stable for the first time.

Homemade swinging links for the neutralizing leads were constructed and installed in the 10-meter final and also in the 20- and the 75-meter finals. All three have been working for over a year and much more satisfactorily than any other method yet tried here.

— Philip Rand, W1DBM

A GRID-DIP METER FOR V.H.F.

IF you do much construction work in the v.h.f. range, you will appreciate the need for a sensitive grid-dip meter to check the resonant frequency of an unknown tuned circuit. It must be small enough to couple into some of the rather minute tuned circuits that are used. To fill such a need in the Headquarters lab, the gadget shown in Fig. 2 was built. It is patterned after the one described in *QST* recently by W2BFD.[1]

An acorn triode in an ultraudion circuit is

(*Continued on page 116*)

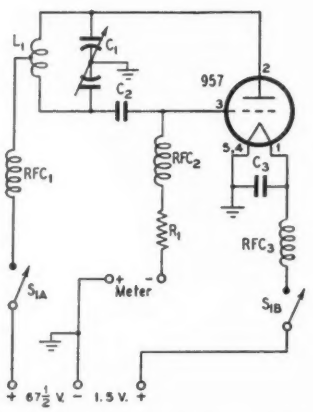


Fig. 2 — Schematic diagram of the v.h.f. grid-dip meter.

C_1 — 11-$\mu\mu$fd. "butterfly" variable (Johnson 160–211).
C_2 — 50-$\mu\mu$fd. ceramic (National XLA-0).
C_3 — 680-$\mu\mu$fd. mica.
R_1 — 68,000 ohms, ½ watt.
L_1 — 2 turns No. 12 wire, 1 1/16-inch i.d., turns spaced 1/32 inch. Ends of coil extend 5/8 inch past o.d. of coil.
RFC_1, RFC_2, RFC_3 — 1-μhy. r.f. choke (National R33).
S_{1A-B} — D.p.s.t. "push-button" type toggle switch, normally open.

[1] Williams, "A Bandpass Converter for 144 Mc.," *QST*, March, 1948, p. 34.

Correspondence From Members-

The Publishers of *QST* assume no responsibility for statements made herein by correspondents.

PUBLIC SERVICE

1810 Spear Street, Logansport, Indiana

Editor, *QST:*

I think we hams are making a mistake in the arguments we emphasize to justify our occupancy of a part of the radio spectrum. We place far too much accent on providing emergency communication and on the training of code operators for the military services. If we continue to base our case on the furnishing of these two services, we are going to wake up some fine morning and discover that the ground has been cut from beneath our feet. Fortunately, there *is* a great contribution that our hobby makes toward the welfare of our country, a contribution that has no danger of becoming obsolete and that does not permit of belittlement: *amateur radio attracts many young men into the field of science.*

That idea is not new, and it may not seem important, but it is. Consider how many boys you know personally whose interest has been won from marbles and kites by the magic of radio. Recall how those boys literally "ate, drank, and slept" radio, putting forth efforts to know more of this subject than their teachers would never have believed possible. Remember, too, how they graduated from high school and went on to engineering schools to learn more and more of this fascinating subject so that it now would take a wise man to label the more correctly "vocation" or "avocation." Do not forget that these same men are the ones who made great contributions to the discovery of radar, frequency modulation, television, and facsimile transmission. No one can evaluate just how much they contributed, directly and indirectly, to the fearful discovery of the atomic bomb.

There is no comparison between the work done by a man who is really interested in what he is doing and that done by another who is simply performing his task for money. This is particularly true in the field of science, for here a man *must* have a consuming interest in what he is doing if he is to rise above the mediocre. Interest, though, is something you cannot buy nor force. It must grow of itself, naturally; but too many obstructions must not be placed in its path, especially at the beginning when it is weak.

Military preparation is rapidly moving from the parade ground to the laboratory. A country must be in the vanguard scientifically if it is to be safe from attack. No effort is too dear that succeeds in attracting young men into the scientific field.

Amateur radio, then, is the candy-coating on the pill, the carrot held in front of the donkey, the rose-strewn path that leads directly into the hall of science. It would be a foolish and short-sighted government that would do anything to injure such an important factor in the military and economic future of our country.

— *John T. Frye, W9EGV*

"ALL THINGS TO ALL MEN"

Lostant, Illinois

Editor, *QST:*

Howard Whitman, writing in the March *Reader's Digest*, says, plus some side remarks of my own:

"Every man ought to strive for at least four satisfying kinds of play. . . . For example, he might have a stamp collection to gratify his acquisitive instinct [owning a nice piece of radio gear should take care of that], carpentry to fill his creative urge [is there any better way of filling the creative urge than by assembling a contraption for long-distance communication?], tennis to get out his aggressions [have you ever been in a Sweepstakes Contest?], and mountain climbing to satisfy his need to dominate and excel [dust off that DXCC certificate]."

Should we tell the psychologists about ham radio?

— *Ben W. Roberts, W9IEU*

WASHDAY BLUES

3 Hull Ave., Dover, N. H.

Editor, *QST:*

How could you? Tsk! Tsk! To print such a thing! "The grease is wiped off with a clean linen handkerchief after drilling is complete" (page 67 of May *QST*). A linen one, no less, and after we wives have tried so hard to train our husbands properly. Especially those so alarmingly infected with "virus radio."

Would you please amend your statement?

— *Ernestine Nutter, W1KKT's XYL*

[EDITOR'S NOTE: This practice is suggested only if the job isn't done on the dining-room table, in which case the tablecloth will serve just as well.]

SWITCH TO SAFETY

78 Clinton Avenue, Eatontown, New Jersey

Editor, *QST:*

Having just missed being a candidate for the Silent Keys column, I can fervently say "Amen, Brother" to your editorial on safety in April *QST*. In particular, I would like to endorse your statement, "But no construction code can protect you adequately, since components can fail and cause death-dealing voltages to appear at unexpected places." Here's my sad tale: The rig is a BC-610D. I set about increasing the antenna coupling. In this I followed the standard tune-up procedure for this equipment, turning off the plate power switch before opening the transmitter lid — which as a further protection is equipped with an interlock switch. The plate tank was then stone cold and I adjusted the antenna link. Turning power on, I found that I had not increased the coupling enough, so I repeated the foregoing procedure, but this time the tank was hot! 2500 volts of d.c. seized my right hand and tossed me into the air. My wife, who was seated near me, reports that she heard a sizzling and looked up to see me rise to about three feet above my chair and slam down again with a bang. With great presence of mind she pulled the power plug from the wall before attempting to help me, but fortunately the convulsion of my arm had pulled the plug-in tank coil from its base, thus releasing me from the power after the initial jolt. For the past two weeks, my right hand and wrist have been swathed in bandages. The doctor says that I am very fortunate in that none of the tendons was damaged, but there was a deep burn and healing is a slow process, so it will be some time before I have full use of the injured hand.

Investigation of the transmitter disclosed that the plate power and interlock switches control the actuating voltage of a relay in the primary feedline of the plate transformer. In some manner or other (probably because of a strong arc) the contacts of this relay welded together and failed to release when the switches were turned off. Since many other hams are using various models of the BC-610, I suggest that you publicize this potential danger. I have learned from Signal Corps personnel that freezing of the relay contacts has been a frequent-enough source of trouble in this trans-

(*Continued on page 118*)

Operating News

F. E. HANDY, W1BDI, Communications Mgr.
J. A. MOSKEY, W1JMY, Asst. Comm. Mgr.
ALBERT HAYES, W1IIN, Natl. Emerg. Coördinator

GEORGE HART, W1NJM, Communications Asst.
A. F. HILL, JR., W1QMI, Communications Asst.
LILLIAN M. SALTER, Communications Asst.

Harmonic Trouble? Cross-Band Calling? Why, we ask ourselves, is it so common in our voice operations to hear calls of "CQ *ten*," "CQ *seventy-five*," "CQ *two*" and the like? Such oft-repeated calls seem most unnecessary when a simple "call to any station" will bring answers. Is it perhaps because so many of us working the 28.5–29.7 Mc. subband have two-meter harmonics or harmonics of other bands? Our local 144–148 Mc. band seems infested with unnecessarily loud signals whose origin is some ten-meter transmitter. We have even called stations mistakenly because of this condition. Is it the same in other cities? But surely the cure for improperly strong harmonics, which none of us can tolerate in the face of a growing television population, is a heart-to-heart session with our transmitter to give it a real engineering going-over for maximum suppression of harmonic radiation. Faraday-screened coupling coils and links and a completely screened-in transmitter (see cover May '47 *QST*) may be honest answers to keeping our harmonics down as required of all amateurs under FCC §12.133. We amateurs, of course, do object strongly to television allocations made so that we cannot work without interference when we are observing the highest engineering standards, and we raise this subject so we can continue our record of keeping harmonics *more* than ordinarily well-suppressed and under control.

Returning to the subject of calling practice, it seems to us that it is just as unnecessary to name the frequency band we are working on in ordinary amateur voice work as it would be in c.w. calling. We never need to state the band on which replies to a call are expected excepting in the rare instance when one is working cross-band and advising the specific frequency for reply. The chances of cross-band reply are, of course, tremendously low in any event unless there is a schedule or some particular understanding or reason for engaging in this type of work. So let's eliminate specifying a band with our calls excepting only when we have a real reason for so doing. There is, however, good sense to specifying the portion of the band which you will tune for replies by use of the signals LM, MH, HM, ML, at the end of your call. Ordinarily a call that is *not* that specific always brings a reply quite close to one's own frequency in this day of VFOs, so no very general band specification is going to help.

Full Call Identification Required. W9CIH in writing us recently asks, "Have you noticed of late the tendency of many fellows to drop the W prefix when signing their calls? This is getting worse right along." FCC requires the *complete* transmission of call identities and cites amateurs who omit the W, K, or numeral prefix or who, when in voice communication, use descriptive words such as "double" or "triple" as a substitute for repeating the letters of their proper call identities, where the same letter exists more than once. FCC *does* provide in §12.82(d) that when using telephony, phonetic aids to identify the call of the station may be employed. Both the call of the station called or being worked and the call assigned a station are to be transmitted "at the beginning and end of each transmission and at least once every ten minutes during every transmission of more than ten minutes' duration. In the case of stations conducting an exchange of several transmissions in sequence, with each transmission less than three minutes' duration, the call of the communicating stations need be transmitted only once every ten minutes of operation as well as at the beginning and at the termination of the correspondence."

Local Work on DX Bands? Rag-chewing in casual QSOs is an enjoyable pastime engaged in by about 92% of all amateurs at a given time. Class B operators express a 76% interest in working DX. DX as well as rag-chewing has a universality of interest. It requires lots of listening on the principle that "You have to hear them before you can work them." DX work on different bands is limited to the times of day when propagation conditions are favorable. When DX is *not* coming through, most of the gang engage in rag-chewing. Many maintain transmitters on non-DX bands for this purpose. A significant number of letters have been received recently commenting on *proper use of the DX bands*. It seems selfish and altogether improper for operators to forget that regulations require the use of minimum necessary power. For operators to engage in local rag-chews at a full kw. when DX is coming through is inexcusable. The Communications Act prohibits the transmission of superfluous signals, yet it has been observed that much unnecessary testing appears on DX and other bands that should and could be confined to a dummy antenna.

A contribution by W6ZZ appeals to us as a

masterly presentation of this subject. Read and heed, please. "Use of our DX bands for purely local contact should be discouraged. It is impossible to make hard-and-fast rules. Each individual ham must ask himself whether in making W or VE contacts he is going to be covering up greater DX for others. What one should do, if not DX-minded, is to ask himself is there some other band where I can still get my W/VE contacts without smothering DX for those who would like to hear it and work it. Because of the congestion and heavy QRM, 20 meters is a comparatively unsatisfactory band for local rag-chewing; almost any other band is better. Twenty meters is, and has always been, our most consistent DX band. It is too valuable as such to be used unthinkingly for local rag-chewing. This applies equally to 'phone and c.w. Also, with our increased numbers it is now more than ever mandatory that we use dummy antennas for our testing. On 20 c.w. listening is getting to be rather agonizing. Dummy antennas aren't taking their share of the load."

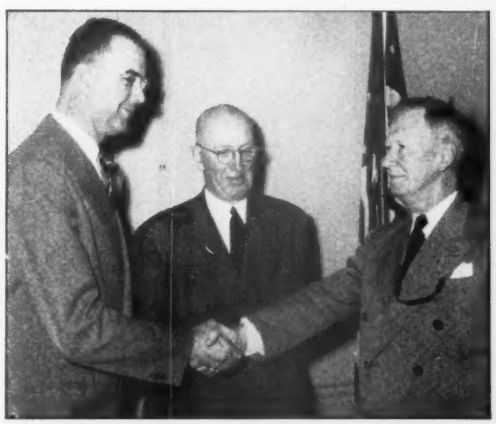
ARRL Field Day — June 12th and 13th. Complete Field Day rules appear elsewhere in this issue. Emergency Coördinators are asked to try to inspire and arrange a test of at least one emergency-powered unit in each community. Clubs and groups afield will receive the usual *QST* listings depending on the number of transmitter groups engaged in FD QSOs at the same time. Our plans for *individual listing* and for identification of the leading not-more-than-two-operator FD stations in the one-transmitter class should appeal to a multitude of operators in communities beyond the operating bailiwick of club and large-group plans. Our analysis of previous Field Days shows that the geographical coverage of amateur radio for *as many cities and towns* as possible is an angle that must receive increasing emphasis. The ARRL Field Day, as always, is dedicated to the testing of self-powered equipment to promote our ability as a body to serve the public interest in event of local or regional disasters of all types.

Is Your Station Emergency-Equipped? Some years ago in the course of a field trip we visited W7FWD. We were pleasantly surprised to find in his shack, entirely separate from the main rig, a small table with separate low-power transmitter, receiver, and emergency power supply, complete with controls and batteries. This independent station was ready for operation in the shack (or transportable elsewhere) for *instant use* in the event of any type of communications emergency! It seems an opportune time to say that we think that *every amateur* ought to feel it a personal responsibility to have such provisions, and to give these a workout in the annual Field Day and in activities sponsored by ARRL Emergency Coördinators for his community at other times during the year.

It ought to appeal as a sound method of building one's amateur station for the chap who works 14-Mc. DX to make his next transmitter a low-power emergency one capable of tying in with 3.5–4 Mc. section nets and with the gang whose interest is traffic coverage of the section and nation! It ought to appeal, we think, to those who work either voice or c.w. on 80 meters to build such an auxiliary for coverage of 7–7.3 Mc. Instead of relegating 25-watt rigs to the attic after this year's FD, let's plan to keep them going in our home station *with the emergency source.* Use these set-ups for portable operating on vacations this summer! Each emergency rig rates full incorporation in the home station. Keep gear always ready by weekly use. Covering an added band with a separate rig adds versatility to our station.

Give *some* emergency-capable equipment a try-out this year (June 12th–13th) even if it's just a 6L6 oscillator, rockbound on one frequency. Prove to yourself and the world in general that you can set up on batteries or other emergency power and establish communication. That is just what you might be called on to do if a big wind wiped out all the power lines in your community.

Prove Your Preparedness. That approach, the test of setting up and trying out one's emergency transmitter, provides fulfillment of the real meaning in our ARRL FD! As we see it, the competitive work is added attraction for some, but *all* win *proof of ability* by completing as much as *one* emergency-powered QSO in the FD! — *F. E. H.*



President Dwight F. Yates, W2PIX, Union County (N. J.) Amateur Radio Association (left), and Col. John H. M. Dudley, chairman, Disaster Committee, Elizabethtown Chapter, American Red Cross, join hands to signify their enduring belief that, in Elizabeth, N. J., amateur radio and the Red Cross shall always work together, while Col. Joseph H. Bigley, chairman, Elizabethtown Chapter, ARC, looks on. The occasion was the dedication of W2GIZ, the Carl F. Mueller Memorial Station, on April 17th, at the Elizabeth YMCA. The station itself, which is dedicated to the principle of amateur public service in emergency, is located in the Red Cross building.

TRAFFIC TOPICS

This month brings us to the close of the very successful 1947–48 traffic season. The past several months have seen us improve the operation of our message-handling system to a high degree of efficiency. There is room for improvement, however, and we should take stock of our operating practices, our net organizations and our station facilities during the summer months. Now is the time to start laying plans for the coming season. Line up your stations, outlets, and other operating details beforehand so that we can make 1948–49 the greatest traffic season on record.

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The Swing Shift Net, which covers New England, has shifted frequency to 7280 kc. This group meets Monday through Friday at 1:00 P.M. EST for those who are working night shifts and can operate only during the daytime.

—···—

Traffic Outlet goes on its summer schedule on June 1st. Continuing operation on 3705 kc. at 10:00 P.M. EST, the gang will meet on Monday, Wednesday and Friday.

—···—

Northern New Jersey Section has supplemented its 80-meter schedule with a 7070-kc. net. The latter meets Monday, Wednesday and Friday at 7:30 P.M. EST and N.N.J. stations are invited to check in at any time.

Introducing W2ANW. T. J. "Tom" Lydon is the kind of amateur who helps to keep the wheels of traffic and other CD organization humming. W2ANW is ORS, OPS, RM, OO, Assistant SCM, OBS and EC. He's a regular on the Northern New Jersey Net and NCS one night a week on TL "C" and Traffic Outlet net. His operating ability is well above par as attested to by his 35-w.p.m. ARRL Code Proficiency Certificate and membership in the A-1 Operator Club.

BRASS POUNDERS LEAGUE

March Traffic

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
WØHMM	26	37	972	21	1056
W7CKT	24	34	991	—	1049
W5LSN	5	58	830	54	947
W2TYU	27	24	788	1	840
W4PL	9	18	622	8	657
W9EVJ	6	38	570	21	635
VE3ATR	489	37	23	1	550
W2QYZ	17	18	488	8	531

The following make the BPL with over 100 "deliveries plus extra delivery credits":

W1FGT 218	W8SCW 194	W3ECP 111
W8IHR 215	W6CMN 138	W8UPB 109
W1JCK 205	W1AW 118	W9LFK 106
W9SYZ 199	VE3DU 118	W6RXT 104
	W2RTZ 117	

A message total of 500 or more, or 100 "deliveries plus extra delivery credits," will put *you* in line for a place in the BPL. The Brass Pounders League listing is open to all operators who qualify for this monthly "honor roll."

VE3BCP in Ontario has organized a network of operators who are employed at radio range stations in Canada. An excellent tie-in with the Beaver Net is available through VE3ATR. The group operates on 7167 kc. at 7:00 P.M. EST using the general call "QDT." All radio-range-station operators in Canada are urged to contact VE3-BCP for further details.

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The New Hampshire Section now has good coverage throughout the state. The 80-meter C.W. Net on 3685 kc., the 75-meter 'Phone Net on 3980 kc., the 10-meter 'Phone Net on 29,200 kc., the 6-Meter 'Phone Net on 52 Mc., and the 2-meter 'Phone Net which is now in the process of organization, provide one of the best coverages of any section.

—···—

Trunk Line "I," the all-Canada trunk, is doing a bang-up job from coast to coast. Every province is now represented. Traffic for Canada may be routed through TLI for speedy delivery.

—···—

The summer schedules of all operating traffic nets would be appreciated for our files. A radiogram to Headquarters will do the trick.

"TRAFFIC" HANDLED BY GLACIER RADIO CLUB

The Big Mountain Ski Tournament on March 7th gave the Glacier Radio Club an excellent opportunity to test emergency equipment. Faced with the problem of controlling two-way traffic over the narrow one-way road leading to the ski course, the local sheriff's office requested that the club provide communications between the main highway and the top of the hill, a distance of about four miles. W7BHP's BC-654 was set up at the highway position and W7LOB's 10-watt

portable was used at the upper end. Communication was established according to plan on the 3.5-Mc. band using both 'phone and c.w., and continued for seven hours. W7AFM stood by with his regular station in Whitefish, Montana, and relayed for the two portable stations during a period of poor signals.

During the operation approximately 200 automobiles were handled in each direction without any traffic difficulties, and both the sheriff and the management of the ski tournament expressed satisfaction with the efficiency of communications. Amateurs taking part in the operation were W7s BHP, EGN, AFM and LOB.

TRAINING AIDS

The rules for use of motion picture films from the ARRL Film Library have been revised slightly to accommodate those clubs who must rent projectors, or who consider it not worth while to set up a sound projector and associated equipment for the benefit of a film lasting only a few minutes.

In the future, affiliated clubs may book more than one film for a single showing *if* they request it far enough in advance. To schedule *two* films for a single showing, your request must arrive here between one and two months *before* the scheduled showing date. To schedule *three* films for a single showing, your request must arrive here between two and three months before the scheduled showing date. Clubs who make double or triple advance bookings in accordance with these rules may not book additional motion picture films in the interim. Two or more films whose running times total twenty minutes or less are considered a single film for booking purposes. The mimeographed rules have been modified to incorporate this new policy.

The restrictions on motion picture films do not apply to film strips or slide collections.

One motion picture film and fifteen tapes have been added to the list of ARRL Training Aids available. Brief descriptions follow:

F24. "Techniques of Hand Sending." 16 mm. sound. U. S. Navy. 9 minutes.

TP11. Inked tape suitable for use on TG-10 or TG-34 keyers. Code characters F, G, H, M, J, R and U.

TP12. Code characters B, D, K, N, T, V and Y.

TP13. Code characters C, E, I, L, O, S and G.

TP14. Code characters A, P, Q, X, Z, 4 and 5.

TP15. Code characters 1, 2, 3, 6, 7, 8, 9 and Ø.

TP16. All code characters for 5-w.p.m. transmission.

TP17. All code characters for 7-w.p.m. transmission.

TP18. Code groups for 10-w.p.m. transmission.

TP19-25. Tactical messages for transmission speeds beginning at 12 w.p.m. with TP19 and increasing to 20 w.p.m. with TP25.

Visitors to the Florida State Fair gather around W4DUG, a station well known to traffic-handling amateurs. Operated by members of the Tampa Amateur Radio Club, this station has seen annual service at the fair since 1935. A well-planned series of schedules tying into regular amateur traffic nets allowed the W4DUG group to handle just under 3000 messages in ten days' operation this year. Transmitters running 400 watts on 3.5 and 7 Mc. and an HQ-129X receiver comprised the main station equipment.

DX CENTURY CLUB AWARDS

DXCC certificates based on postwar contacts with 100-or-more countries have been issued to the amateurs listed below. The countries-worked totals indicated have been certified by examination of written evidence under the award rules as published in March 1947 *QST*.

HONOR ROLL

W1FH	186	G6ZO	165
G2PL	173	W3BES	164
W6VFR	172	W3GAU	162
W8HGW	171	W1CH	160
W4BPD	166	W2BXA	160

NEW MEMBERS

VE7ZM	135	W6KUT	104
W2NSZ	127	WØSQO	104
W6DI	123	VK2DI	103
W5LGG	115	W8ERA	102
ZL1BY	114	W9FJB	101
HB9DO	113	W6POZ	101
W2RGV	109	W3OP	101
OK1LM	108	W1NMP	101
ON4JW	108	W6VBY	100
ZL2QM	107	KP4KD	100
W1CLX	107	I1IV	100
W2PWP	104		

ENDORSEMENTS

W6SAI	156	W9KOK	122
W5ASG	150	W6LER	121
W7FZA	142	W3EVW	120
ZS2X	141	W6BAM	112
W4CYU	141	W4DKA	111
W1ME	140	W1ENE	111
WØGKS	130		

RADIOTELEPHONE

HONOR ROLL

W1FH	148	W2BXA	111
W1JCX	130	W2ZW	110
W4CYU	130	W1NWO	110
W1HKK	124	W6DI	110
G2PL	119	VQ4ERR	109

NEW MEMBERS

G6WX	101

WITH THE A.E.C.

The N. Y. C.-L. I. Emergency Corps, under the leadership of SEC W2BGO, has conducted a series of intersection tests between their 144-Mc. group and the v.h.f. groups of Newington, Conn., Hartford, Conn., and Binghamton, N. Y., via their respective 3.5-Mc. nets. These tests have brought to light the limitations of the groups involved as well as their points of excellence, and it is anticipated that, as further tests are conducted, the speed and accuracy of such internet traffic handling will be greatly enhanced.

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The Radio Club of Arizona (Phoenix) has formed a completely emergency-powered net operating both 'phone and c.w. in the 3.5-Mc. band.

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ARRL Regional Coördinator W1LKF has announced the organization of the Connecticut River Emergency Net, dedicated to the service of the U. S. Weather Bureau's many river-observing stations along that stream and its tributaries. Weather information and reports of flood conditions along the river are handled during drill each Wednesday evening, and if the old Connecticut decides to go on a rampage again it will find the gang on 3580 kc. ready to help tame it.

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When the Milwaukee Railway found itself without communication between Roscoe and Aberdeen, S. D., on March 26th, the South Dakota gang really "came through." Although their traffic route was circuitous, some 700 miles of routing to cover the 50 miles between Roscoe and Aberdeen, WØBLK, WØOLB, and WØUVL handled the railway's traffic in the finest traditions of public service.

—···—

The Society of Amateur Radio Operators, of the San Francisco Bay area, operates a "slow-speed" net for the purpose of assisting interested amateurs to attain increased code proficiency with a view to the supplying of improved emergency operating facilities. This net operates on 3791 kc. each Wednesday evening at 7:00 PST.

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The Suffolk County (New York) Emergency Corps holds weekly drills on 3600 kc. on Wednesdays at 7:30 P.M. EST. Traffic handling is the "order of the day" so that the gang will be best prepared to handle third-party traffic when, and if, disaster strikes.

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The Milwaukee AEC group has 27 active stations, all crystal-controlled, on 144 Mc., and holds weekly drills. It is anticipated that the group will soon extend its coverage into Southern Wisconsin and Northern Illinois.

—···—

A simulated emergency test conducted by the Washington AEC on March 7th brought out some 150 member stations operating on all bands, both 'phone and c.w. Both the AEC members and the members of the section traffic net found the test valuable.

—···—

Communications Department Operating Aid Number 4, a card describing the ARRL Emergency Corps and giving suggestions for your emergency operation, is presently available on request from ARRL Headquarters.

W6YMY/6, station of the Pomona (Cal.) High School Radio Club, "on location" on a combined emergency test-field day excursion during Easter vacation. Chief Operator W6ARV is in the operating position, with other club members looking on.

ILLINOIS AMATEURS SERVE AGAIN

When a tornado struck Fostersburg, Gillespie, and Bunker Hill, all small towns in Southern Illinois, on the morning of March 19th, amateur radio once again had an opportunity to provide emergency communication. Groups comprising both home stations and portables, rushed to the scene by emergency-minded amateurs normally residing outside the affected area, set up for operation within a few hours after the fury of the storm had been spent. The latter included W9KQL/9, W9UQT/9, and W9EOP/9, who operated at Bunker Hill; W9VOA/9 at Gillespie; and W9JFG/9 and W9UHD/9, who operated at both Gillespie and Carlinville through which the majority of the emergency communications were being routed. These intrepid amateurs operated under a difficulty new to most operators — the power companies were bringing power lines into the disaster zone without insulators and the QRN was terrific! At 7:30 P.M. on the 20th it developed that the telephone company had restored normal service and the hams shut down for a hard-earned rest. The Salvation Army, Red Cross, American Legion and VFW provided food and drink for the amateurs and reams of traffic for their transmitters, and the Illinois State Police coöperated with the operators in every possible way.

Among the stations outside the emergency

area who contributed to this successful demonstration of what amateurs can do in a communications emergency were: W9s AEX, AEZ, APX, BIK, BMV, CCW, CRM, CTZ, DHW, EBX, EEM, ENI, FIN, HSB, IER, ILH, KCW, KDU, LXT, MJV, MXD, NRF, NSD, OGE, PEK, PLS, RPL, RVT, SSP, YJH, ZSN; WØs CVU, DUD, FQY, GCT, JRJ, KQX, KSR, OML, RNF, and WRT.

Y.L.R.L. NOTES

The combined Membership Drive-QSO Party of February, 1948, resulted in 59 new members for YLRL, including several in countries new to the organization. Prizes went to: Enid Aldwell, W6UXF, chairman of the winning district (6th) which gained the highest collective score; Lou Littlefield, W1MCW, for the highest 'phone-only score (and highest individual score); Clarice Goodman, W7FTX, highest 'phone-c.w. score; Enid Aldwell, W6UXF, highest c.w.-only score. Louisa Dresser, W2OOH, and Lillian Ruocco, W2PMA, were given special recognition certificates for outstanding work in the membership drive, as was Helene Leonard, W6QOG/MBD, who is NCS of the 10-Meter Net.

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The next YLRL QSO Party will be the "C.W. Spree," June 3rd, 4th and 5th on 3.5, 7 and 14 Mc. respectively. This activity is designed to help YL operators find each other on the c.w. bands so that those working toward the WAS/YL Certificate may catch certain elusive states.

BRIEFS

During one of his daily skeds with W6WII on 7 Mc., Bob Higgins, W6WQV, was telling of a dream he had had the previous night in which his trailer home had caught fire. He had hardly finished the description when he heard his XYL calling for help. Glancing around, he beheld flames leaping to the ceiling! The trailer gasoline stove was belching S9 flames which threatened to fulfil Bob's dream. Little damage was done, however, and the flames were subdued with the aid of a bucket of sand. W6WII stood by during the "emergency" and the contact was eventually resumed. Who says dreams don't come true?

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On February 13, 1938, WØYBD worked W9KBD on 160-meter 'phone. W9KBD made out a QSL card to WØYBD but neglected to mail it. He did so on February 3, 1948, appending a note which said, "Forgot to mail this card ten years ago." The QSL arrived at WØYBD February 13th, ten years to the day from the time the contact was made!

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Coincidence: W5HOX sent radiograms to W1LRZ asking for a schedule and leaving the choice of band and frequency to the latter. He also sent a similar message to W6VUO. Replies were received in due course. Both W1LRZ and W6VUO independently had chosen 7040 kc.! We'd hate to figure the odds on such an occurrence repeating itself, considering the countless frequencies that might have been selected!

A.R.R.L.-AFFILIATED CLUB HONOR ROLL

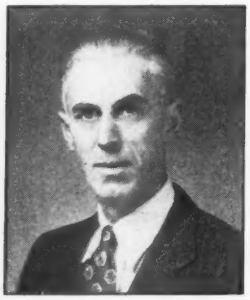
All members of these clubs are ARRL members

The Above 100 Club, Winnipeg, Man., Canada
Albany Amateur Radio Club, Albany, Ga.
Amateur Radio Club of Savannah, Savannah, Ga.
Amateur Radio Transmitting Society, Louisville, Ky.
Astoria Radio Club, Woodside, N. Y.
Bartlesville Amateur Radio Club, Bartlesville, Okla.
Chattanooga Amateur Radio Club, Chattanooga, Tenn.
Chester Radio Club, Chester, Pa.
Cleveland Amateur Radio Society, Cleveland, Ohio
Conneaut Radio Club, Inc., Conneaut, Ohio
Connecticut Wireless Association, Newington, Conn.
CQ Radio Club, Torrington, Conn.
Detroit Amateur Radio Association, Inc., Detroit, Mich.
The Detroit Metropolitan Radio Club, Detroit, Mich.
Fairmont Radio Club, Fairmont, Minnesota
The 56 Mc. Minutemen, Medford, Mass.
Frankford Radio Club, Philadelphia, Pa.
Garden City Radio Club, Garden City, N. Y.
Grumman Amateur Radio Club, Bethpage, L. I., N. Y.
Iowa-Illinois Amateur Radio Club, Burlington, Iowa
Jersey Shore Amateur Radio Association, Long Branch, N. J.
Maui Amateur Radio Club, Wailuku, Maui, T. H.
Mount Shasta Amateur Radio Club, Mount Shasta, Calif.
Newington Amateur Radio League, Newington, Conn.
Northern California DX Club, Inc., Oakland, Calif.
Northwest Amateur Radio Club, Des Plaines, Ill.
Order of Brass Founders, Chapter 3, Kansas City, Mo.
Pioneer Radio Club, Fremont, Nebraska
Providence Radio Association, Inc., Providence, R. I.
The Ridgewood Radio Club, Ridgewood, New Jersey
Santa Clara County Amateur Radio Association, Inc., San Jose, Calif.
Santa Monica Mike & Key Club, Inc., Venice, Calif.
Somerset Hills Radio Club, Summit, N. J.
South Lyme Beer, Chowder and Propagation Society, South Lyme, Conn.
Starved Rock Radio Club, Utica, Illinois
T-9 Radio Club, Danvers, Mass.
Union County Amateur Radio Association, Inc., Elizabeth, N. J.
Valley Radio Society, North Hollywood, Calif.
Walla Walla Radio Amateur Club, Walla Walla, Wash.
Westfield Amateur Radio & Emergency Communications Assn., Westfield, Mass.
Winston-Salem Amateur Radio Club, Inc., Winston-Salem, N. C.
York Road Radio Club, Elkins Park, Pa.

MEET THE SCMs

Walter L. Glover, W1VB, Connecticut's SCM, has enjoyed amateur radio since 1914, although his license was not obtained until 1925.

W1VB's operating position is situated on the first floor of his house, while finals and power supplies are kept in the basement. Transmitting line-up includes the following: 6SK7-6J5-6V6-807 crystal-VFO exciter followed by separate amplifiers, an 810 running 550 watts on 3.5 Mc., a pair of 813s at 650 watts on 7 Mc. and 600 watts to 813s on 14 Mc. Receiver: BC779A Super-Pro. Antennas in regular use: three half-wave doublets, coaxial-cable-fed, for each band used.



In August, 1940, Glover was awarded a 35-w.p.m. Code Proficiency Certificate and has since increased his speed to 45 w.p.m. He has held an A-1 Operator Certificate since before the war. Although interested mainly in traffic handling, he is a versatile amateur and has participated in SS and CD Contests, was RM and assistant SCM, which posts he relinquished upon his election as SCM, and now is ORS and assistant director. The Candlewood Amateur Radio Association of Danbury claims him as a member.

From 1917 to 1918 and again from 1919 to 1923 he held positions as radio operator, taking time out in between to serve in the Navy.

A civic-minded citizen, Walt takes a keen interest in town government and affairs, is chairman of the Board of Fire Commissioners, chief of the Newtown Fire Department, and a member of the Board of Finance. His favorite sport is bowling. At present he conducts his own electrical contracting business.

BRIEF

The Fort Wayne Radio Club is sponsoring a "WFW" contest, open to all amateurs. Object of the competition is to work as many stations as possible in Fort Wayne, Indiana. Prizes will be awarded to the amateurs who have worked the greatest number of stations by a date to be announced later. The contest is of a continuing nature and does not close on the awarding of prizes. A certificate will be awarded to each amateur who contacts 50 Fort Wayne hams and endorsement stickers will be awarded for each additional ten stations worked. QSL verification of contacts is preferred, but the station log will be accepted in lieu of QSL cards. At least 5 contacts of the 50 must be on c.w. and 5 on 'phone. Further details may be obtained from Harold Norton, jr., W9PRO, 1723 Sherman St., Fort Wayne, Indiana.

F.M.T. RESULTS

Continued interest in the ARRL Frequency Measuring Tests is indicative of the pride taken by many amateurs in their ability to measure radio frequencies with accuracy. The First 1947 ARRL Frequency Measuring Test, one of two such competitions open each year to both ARRL Official Observer appointees and other amateurs, brought entries from 192 participants. Measurements were submitted by 75 OOs and 117 non-appointees.

Individual ratings, based on comparison of measurements of the frequencies used by W1AW during the special FMT transmissions on January 23rd with those made by a commercial frequency-measuring laboratory, have been sent to each participant. The following frequencies were used by W1AW:

3755.479	3643.673
14302.080	7138.938
28005.12	14399.074
	28030.08

The leader in each group has received a G. E. Type 8H58 Select-O-Switch clock in recognition of his efforts. Prize winner in the OO category was T. J. Lydon, W2ANW; in the non-OO class, Lloyd W. Root, W8HB.

The standings of other leaders in the FMT are tabulated below. No entry consisting of a single measurement was considered eligible in the prize competition. Except where indicated, entries included two or more measurements.

LEADERS

Observers	*Parts/ Million*	*Non-Observers*	*Parts/ Million*
W2ANW	1.1	W8HB	1.8
W9CIH	1.7	W2MRG	2.1
W8WWL	1.9	W2RYT	3.2
W2BF	3.3	W2CVV	3.8
W7CQE	3.9	W8GXI	4.9
W5AIR	7.2	W6CQI	5.9
W1LQQ	8.8	WØEG	6.7
W3VNE	9.7	W1MUN	7.0
W9KA	9.7	W1KSD	7.9
W1DWO	11.7	VE3PO	8.1
W3ASW	11.7	W7GPP	8.4
W1LVQ	11.8	W7BQS	9.2
W1PXH	12.3	W1BGW	10.1
WØOTR	13.4	W2IDZ	10.7
VE1QU	14.7	W2WFU	10.7
W6DFO	16.1	W4IIY	11.9
W9SRN	18.2	W9JNU	11.9
W2NCY	19.2	W1LKF	12.2
W1VW	19.8	W9VDB	12.8
W8LEC	20.1	W1BB	13.6
W6GTE	21.1	W5HOU	13.6
W6IWU	21.6	W1AYO	13.7
VE6HM	22.2	W9PVA	13.8
W8SDD	24.1	W9BOR	13.9
W8JRG	25.5	W3MBF	14.8
		W3MCG	14.8

The following ratings are based on a single measurement: OOs — W1ON 4.9, W3EYX 5.6, W6GC 10.13, W2WI 16.7, W4IYC 20.0. Non-OOs — W2PAH 0.2689, VE2JN 11.3, W1APK 12.4, W1AJQ 14.5, W1QGT 14.5.

A.R.R.L. ACTIVITIES CALENDAR

June 12th–13th: ARRL Field Day
June 21st: CP Qualifying Run
July 14th: CP Qualifying Run
July 24th–25th: CD QSO Party
Aug. 19th: CP Qualifying Run
Sept. 14th: CP Qualifying Run
Sept. 25th: V.H.F. Party
Oct. 16th–17th: Simulated-Emergency Test
Oct. 18th: CP Qualifying Run
Oct. 23rd–24th: CD QSO Party
Nov. 13th–14th: Sweepstakes Contest ('phone)
Nov. 17th: CP Qualifying Run
Nov. 20th–21st: Sweepstakes Contest (c.w.)

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Jan. 1st–Dec. 31st: Most-States V.H.F. Contest
First Saturday night each month: ARRL Officials Nite (Get-together for SCMs, RMs, SECs, ECs, PAMs, Hq. Staff, Directors, Alt. and Asst. Dirs.)

CODE-PROFICIENCY PROGRAM

Have you received an ARRL Code Proficiency Certificate yet? Once each month special transmissions are made to enable you to qualify for the award. The next such qualifying run will be made on June 21st at 10:00 P.M. EST. Identical texts will be sent simultaneously by automatic transmitters from W1AW, W6OWP and WØCO. Frequencies of transmission from W1AW will be 3555, 7215, 14,150, 28,060, 52,000 and 146,000 kc., from W6OWP 7248 kc., from WØCO 3534, 7053 and 14,040 kc. Send your copies of the qualifying run to ARRL for grading, stating the call of the station you copied. If you qualify, you will receive a certificate. If your initial qualification is for a speed below 35 w.p.m., you may try later for endorsement stickers indicating progress above the first certified speed.

Code-practice transmissions are made from W1AW each evening, Monday through Friday, at 10:00 P.M. EST. Take advantage of these transmissions to increase your code proficiency. References to texts used on several of the practice transmissions are given below. These make it possible to check your own copy.

Date:	Subject of Practice Text from April *QST*:
June 2nd:	*Selectable Single-Sideband Reception Simplified*, p. 11.
June 4th:	*An Oscillator for the 1215-Mc. Band*, p. 16
June 7th:	*Selectivity in S.S.S.C. Reception*, p. 19
June 10th:	*Better Reception for 2-Meter Mobile*, p. 23
June 15th:	*An Automatic Keying Monitor*, p. 27
June 17th:	*A Balanced-Modulator N.F.M. Exciter*, p. 33
June 21st:	Qualifying Run, 10:00 P.M. EST
June 23rd:	*Self-Filtered Peak Clipping*, p. 36
June 25th:	*Compact 20-Watt Rig for 50 Mc.*, p. 44
June 29th:	*Notes on Push-Pull Triodes*, p. 55

ELECTION NOTICE

(*To all ARRL Members residing in the Sections listed below:*)

You are hereby notified that an election for Section Communications Manager is about to be held in your respective Sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more ARRL full members of the Section concerned, in good standing, are *required* on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been a licensed amateur for at least two years and similarly a full member of the League for at least one continuous year immediately prior to his nomination.

Petitions must be in West Hartford, Conn., on or before noon on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given herewith. The complete name, address, and station call of the candidate should be included with the petition. It is advisable that eight or ten full-member signatures be obtained, since on checking names against Headquarters files, with no time to return invalid petitions for additions, a petition may be found invalid by reason of expiring memberships, individual signers uncertain or ignorant of their membership status, etc.

The following nomination form is suggested:

Communications Manager, ARRL (Place and date)
38 La Salle Road, West Hartford, Conn.

We, the undersigned full members of the.....
.....ARRL Section of the.....
Division, hereby nominate.....
as candidate for Section Communications Manager for this Section for the next two-year term of office.

Elections will take place immediately after the closing dates specified for receipt of nominating petitions. The ballots mailed from Headquarters to full members will list in alphabetical sequence the names of all eligible candidates.

You are urged to take the initiative and file nominating petitions immediately. This is your opportunity to put the man of your choice in office.

— *F. E. Handy, Communications Manager*

Section	*Closing Date*	*SCM*	*Present Term Ends*
Arkansas	June 1, 1948	Marshall Riggs	June 14, 1948
North Carolina	June 1, 1948	W. J. Wortman	June 14, 1948
Virginia	June 1, 1948	Walter R. Bullington	June 14, 1948
Nevada	June 1, 1948	N. Arthur Sowle	June 15, 1948
Northern New Jersey	June 1, 1948	John J. Vitale	June 17, 1948
Idaho	June 1, 1948	Alan K. Ross	June 17, 1948
Manitoba*	June 15, 1948	A. W. Morley	Resigned
Ontario*	June 15, 1948	David S. Hutchinson	May 1, 1948
British Columbia*	June 15, 1948	W. W. Storey	May 1, 1948
Colorado	June 15, 1948	Glen Bond	April 17, 1948
Philippines	July 30, 1948	George L. Rickard	Oct. 15, 1938
Ohio	July 30, 1948	William D. Montgomery	Aug. 17, 1948

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* In Canadian Sections nominating petitions for Section Managers must be addressed to Canadian General Manager Alex Reid, 169 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided in our Constitution and By-Laws, electing the following officials, the term of office starting on the date given.

Tennessee	Ward Buhrman, W4QT	Mar. 15, 1948

In the Georgia Section of the Southeastern Division, Mr. Clay Griffin, W4DXI, and Mr. Warren S. Pope, W4HDC, were nominated. Mr. Griffin received 88 votes and Mr. Pope received 86 votes. Mr. Griffin's term of office began March 8, 1948.

• All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — Report from the Lancaster Radio Transmitting Society: DYT is erecting a new 80-ft. tower. QV will attend its third annual dinner meeting. NOK is graduating from 144 to 7 and 3.5 Mc. New officers: KIE, pres.; NOY, vice-pres.; OY, secy.; DYT, treas.; NOK and LN, board of directors. MAC has started a flood network on 28 Mc. for the Lehigh Valley section. They are receiving excellent press publicity. MAC is most interested in working with the W2 stations around Trenton. Give him your support, you fellows in his territory. He also is active on 144 Mc. and is trying to get through to Philadelphia. In 15 months MAC has worked 78 countries on 28 Mc. with only 55 watts. Quite a stunt, for he cannot see. The Delco Club has its station, DUU, on with 250 watts on 3.5-Mc. c.w. The Harrisburg Club is organizing an emergency net with fixed portable and mobile equipment. The E. Pa. net wants more traffic to keep the net hot. QEW reports KLZ, KFU, LCK, LKL, NIU, QGE, and himself very active on 144 Mc. LAK is activities manager for the Susquehanna Valley Amateur Radio Club. Members in that area, please get your activity reports to him right after the first of each month since the SCM must file with ARRL on the 7th. DZ received a Trunk Line Certificate. MPY has his 28-Mc. mobile working fine. ELI and EU have new QTHs. MET is back on his OO job again. CAU snagged four out-of-band stations this month. AQN has 100 watts on 144 Mc. Members of the Frankford Radio Club are trying to keep the high end of the 50-Mc. band occupied and now represent about 90 per cent of the activity in the area. They have been putting out DX broadcasts to encourage listening by stations not ordinarily attracted to v.h.f. but would be interested in gleaning the latest and hottest DX information from the most active DX group in the country. The FRC feels that similar action by the various radio clubs would bring enough activity to the 50-Mc. band, especially the 54-Mc. end, to assure our retaining the band. The use of 50 Mc. takes a load off the crowded DX bands and to date the sixteen active FRC members have not had a t.v.i. complaint. Traffic: (Feb.) W3OML 20. (Mar.) W3VMF 150, KFA 148, EU 86, QEW 60, QV 47, DZ 40, AQN 37, OML 10, CAU 5, ID 5, NNV 3.

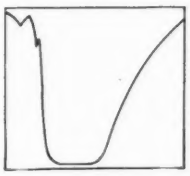
MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Eppa W. Darne, W3BWT — The Baltimore Amateur Radio Communications Society had two splendid speakers at its March 15th meeting. John Reinartz, 3RB, spoke on "Simplified F. M.," and our Atlantic Division Director, "Brad" Martin, 3QV, talked on ARRL activities. Both talks were extremely interesting. A large group of hams from Baltimore were in attendance, plus a group from Washington. At its first March meeting the Washington Radio Club devoted most of the evening to a discussion of a new constitution, submitted by the constitution committee, ECP, FMC, and MAX. Talks on their Hawaiian trip by MHW and MSK were enjoyed by the membership. At the second March meeting, the Club visited the television studios of the DuMont Company, WTTG. The Capitol Suburban Radio Club has a net on 29,009 kc. OFS is newly-licensed station at College Park, Md. MJQ is having "antenna-landlord" troubles. CJT has been appointed ORS. JVG is on 3.5 Mc. and is building equipment for 420 Mc. MLJ reports from England and is spending a great deal of time visiting British hams. He has also been on 14-Mc. 'phone at G5GK. KHM has a new h.f. 28–14-Mc. converter. LCB, a new ham in Greenbelt, is on 7 Mc. NOL is building a mobile rig for 28 Mc. FYB is working nights, but gets on with his mobile rig while traveling to and from work. MCA has a new Collins VFO. MJQ is putting out a nice signal on 3.5 Mc. using a ten-foot indoor antenna. AQV has moved to his summer operating position "Studio A." AHQ is rebuilding, but is on with temporary rig. ECP is on 28-Mc. 'phone; he also makes BPL this month. 2NDL/3 had highest traffic total in the section. LVJ has worked 109 countries with that famous 807. EFZ has a Q5-er using BC-453. JZY is building a 144-Mc. converter. CJS is back on 7 Mc. after 14 years off, and is getting out fine using an indoor antenna. IZL is calibrating a new frequency meter, and recently worked 15 new countries on 28-Mc. 'phone. DVO is rebuilding his rig for 400 watts. LVM has a new 200-watt rig on 28-Mc. 'phone that works very well. KFO is on 144 Mc. CDQ is using indoor antenna on 7 Mc. and gets out OK. Traffic: W2NDL/3 339, W3ECP 324, AKB 133, BWT 55, QL 36, MJQ 33, AKR 27, JZY 22, CJS 6, AQV 4, JVG 3.

SOUTHERN NEW JERSEY — SCM, G. W. (Bill) Tunnell, W2OXX — We hear from GCU after a long silence. He has just finished his new antenna. ORS is listening on the 420-Mc. band but results are poor. BAY will spend the coming months working on his boat. CFB soon will be active from Toms River. RG reports favorable response to automatic roll call for the 3700-kc. net. PAU, RXZ, and QED are active in the new 144-Mc. "X" Net operating from New York to Washington, D. C. QUH is mastering his radio course and is therefore more active. Congratulations to ZI and the "committee" for another FB Old Timers' Nite. SUG has been a recent Alternate NCS for the SNJ-ORS Net. RPH is having B.C.I. troubles. SAK is still slugging hard at emergency work. HAZ reports that the Delaware Valley Club is sponsoring two contests for its members, one for the first three SWLs hearing all states and the other for the first three amateurs working all states, both requiring confirmation. The recently-elected officers for this club are: SMP, pres.; UPS, vice-pres.; HAZ, secy.; and H. L. Yoder, treas.; whose recent death is mourned by all. Look for OSB/9 on 3.5- and 7-Mc. c.w. RDK reports by letter that an automobile smashed his beam in a freak front yard accident. The SJRA has guest speakers planned for the next three months. PWM, ex-3DAJ, is active again on 14 Mc. Traffic: W2RPH 266, SUG 79, ZI 53, QUH 42, PAU 19, RG 18, BAY 14, CFB 14, BEI 11, GCU 7, ORS 7.

WESTERN NEW YORK — SCM, Harding A. Clark, W2PGT — SEC: SJV. RM: FCG. New appointments: ORS: WFU. RM: FCG. On March 26th the Triple Cities 144-Mc. net held a simulated emergency drill with the NYC/LI 144-Mc. net with NYS and NYC/LI 3.5-Mc. nets as the relay link. There was a total of 24 stations participating and the test ran off without difficulty. Congratulations on a job well done. Plans are now under way to conduct similar tests with other 144-Mc. nets throughout the section. Will you be ready when the time comes for your drill? The following ECs have been appointed: WQI for Oneida County; DV for Washington, Warren, and Saratoga Counties; QJT for Tompkins County; and SXR for Otsego County. New officers of RAWNY are: TBD, pres.; QWS, vice-pres.; UJR, secy.; UYG, rec. secy.; AFY, treas. FCC Engineer Rockman was guest at RAWNY meeting and QHF explained s.s.s.c. transmission and reception. QHF also spoke on television transmitters and receivers at KBT meeting. ORG, UZS, VZX, WQR, RXM, RTA, and OPZ keep Buffalo on the 7-Mc. map. WME has reached the century mark on 28-Mc. 'phone. UHJ will be on with s.s.s.c. rig from new location. Oneida County 144-Mc. net now includes WQI, VUF, SOD, QFG, WHN, and TRG. More members are wanted. Drills are held each Sunday at 9 P.M. VUF is the first to successfully convert SCR-522. The Utica Amateur Radio Club raffled a.m.-f.m. console to raise funds for treasury. QNA and TJB are on 50 Mc. YDU is new ham in Niagara Falls. QHH has retired from 3.5-Mc. DX for the season and wound up with 36 countries using 10 to 17 watts. What would he do with a kw.? AOR gave 3.5-Mc. DX a whirl and landed G2JT, ON4AU, and FA8BG. HZP is newcomer to Hornell. The Oneida Club had good attendance and program followed by a bang-up feed at its recent open house. Syracuse Radio Club now meets at its new quarters in WFBL studio. Meetings are held second and fourth Thursday of each month. Everybody in the area is cordially invited to attend. We are all glad to hear that RUF had a speedy recovery after recent operation and is back on the air. Traffic: W2NAI 354, PGT 343, BLO 146, FCG 116, WFU 98, SJV 94, VIQ 85, SXR 58, WOE 52, GWY 42, SZK 40, RUF 38, UYG 36, AOR 24, QHH 12, QNA 10.

WESTERN PENNSYLVANIA — SCM, Ernest J. Hlinsky, W3KWL — EC: UST. RMs: TOJ, MJK, and NUG. PAMs: AER and RAT. In Altoona the 144-Mc. boys are going strong with MLU, RFM, MYN, and LQD doing the honors. TXQ is using 14-Mc. folded dipole. LJQ built a 28- and 50-Mc. converter and is looking for 50-Mc. contacts. The Horseshoe Radio Club presents code classes for beginners. LJQ is editing club paper. UVD reports the following: WESCO gang wants to become affiliated with ARRL. A theory group for Class A and B is in the making.

(*Continued on page 78*)



WE HAVE read with interest the various articles on amateur s.s.s.c. and probably you have too. One thing that quickly becomes obvious is that the transmitter must be of simple straight forward design to be practical for the uninitiated. This is particularly true due to the newness of techniques as well as newness of the idea to many of us.

The classical s.s.s.c. transmitter is one having a first modulator operating at a low frequency so that the unwanted side band can be eliminated by a good filter. The carrier is supressed by the modulator with this system.

The first modulating and filtering operation in the transmitter is probably the most difficult. With this thought in mind National has made available the type F-22 side-band filter so that this difficult problem can be solved more easily. A low center frequency was picked to assure that good filtering would be obtained. If 200 cycles is considered to be the lowest audio frequency to be used, this filter should attenuate signals that are 400 cycles or more outside of its pass band by at least 50 db. to eliminate the unwanted side band. This figure is suggested on the basis of a high standard of performance and can be obtained with the F-22 side-band filter.

Due to the "universal" nature of selectivity curves for either i.f. transformers or filter sections, the slope of the attenuation characteristic at the side of the pass band in db. per kilocycle becomes greater as the center frequency is lowered if the same Q, etc. is maintained. This is why it is necessary to go to a low frequency in order to effectively eliminate one of two frequencies which are separated by only 400 cycles as is the case at the output of the first modulator in the s.s.s.c. transmitter.

It is interesting to note that the percentage difference between the closest frequencies that must be separated may be less at the output of the second modulator than at the output of the first modulator in typical arrangements. However, at the second modulator output, it is usually not a difficult filtering operation because the required coil Q is relatively easy to obtain at these higher frequencies. If this were not the case, a second special filter would be necessary.

Similarly, the third modulator output filtering does not require a special filter if 75 and 20 meter phone operation only is contemplated.

Give s.s.s.c. a try and let us know how you make out. We believe it holds a great future for amateur radio.

RALPH HAWKINS, W1OEX

LEJ is club secretary. OFJ is a new station. OMG has an RME-69 receiver. FIH finds 14-Mc. 'phone too tough so is trying 7-Mc. c.w. VNE was busy as OO in DX Contest. KTA reports FB results on 14-Mc. n.f.m. LIM worked his first J in 25 years of radio. AER is knocking 'em off with a VR and ZC contact. LGM schedules LF2K each Sunday. GJY did a nice job running W. Pa. ORS Net. MHE was busy as OO; he claims 47 c.w. violators. Up north LOD is keeping tabs on VE 'phone QRM on 3750 kc. LQQ is faithfully holding the ORS Net. MOT says there are two SCR-522s in town on 144 Mc. Congrats to MOT on the nice ARRL Party score. The Upper Ohio Valley Emergency Weather Net is well organized with the following, in addition to PY as NCS and MPO as ANCS, reporting each Sunday at 9 A.M. on 3965 kc.: CAV, HUL, RMM, BOZ, JW, VRZ, LIK, PFW, UG, IB, SGA, 8PHY, 8UTO, 8MIS, and 8JIL. In Erie QKI has given up 144 Mc. for television. VHP and LJF had beams down in storms. In Mercer County the 144-Mc. craze is on. You 144-Mc. DX hounds can always get a QSO any night with these valley stations on. LNA and MQW are heard nightly on 144 Mc. The Mercer County Radio Club will become an ARRL member club. AAT is knocking off nice DX on 27-Mc. 'phone. ODB, with 30 watts and in two months, has worked 31 states and Cuba. Keep your eyes open for the Brass Pounders and Modulators Club of Pittsburgh summer hamfeast, same time and place as last year. Traffic: (Jan.) W3KKA 71. (Feb.) W3KKA 114. (Mar.) W3YA 197, KKA 135, GJY 84, MHE 38, KWL 36, NCJ 34, NT 31, AER 30, LGM 12, LOD 12, LWN 9, LQQ 5, MOT 2.

CENTRAL DIVISION

ILLINOIS — SCM, Wesley E. Marriner, W9AND — The KRC Club was organized at DeKalb with SIU, pres.; ATW, vice-pres.; TWM, secy.; WED, treas. Meetings are held the second Monday of each month. DAX and KZO demonstrated crystal grinding at a recent meeting of the club. UPW is working on a higher code speed. LBL joined the Daylite Net. Starved Rock Radio Club news: ZEN is struggling with a pair of 813s in a new rig. NIU is on 3.85-Mc. 'phone with 7 watts. NOO plans a comeback and has purchased a receiver and parts for rig. IDA is looking for last few states for 14-Mc. 'phone WAS. CDG, ATA, YBY, and JAU plan publicity for ham radio in Streator paper. A hamfest has been planned for June 6th. 2STX/9 described operations at Bakelite plant at Ottawa. ACJ reports the following Illinois Valley Radio Assn. news: OBB is rebuilding. ZHB, JVC, and PBY are on 50 Mc. with ZHB working out 200 miles. Field Day preparations were made and members are eager to participate. The Club Net operates Monday, 8 P.M., on 28-Mc. 'phone and Sunday, 9 P.M., for c.w. IQC has remodeled into a classy shack. OLM, the 3.85-Mc. engineer, is to go up for his Class A ticket soon. WDD has a new Silver 701 rig and 28-Mc. dipole. TAL has an HT-18 driving an HT-9 and has 55 countries postwar on 14 Mc. LQP is working nights and looking for daytime traffic nets. BRX has new frequency standard and will have radar antenna rotator for 14-, 28-, and 50-Mc. beams. ASN has started in traffic work and is doing quite well. NN is on 7 Mc. nightly looking for A-1 Operator Club material. PEK is new EC for DeWitt County. Wind took both poles at IFM. CTZ is new ORS. BUK is busy organizing Radio Emergency Assn., Red Cross set-up at Evanston, with BUK, pres.; TO, comm. mgr.; UIN, vice-pres.; PSR, secy. Close coöperation with State traffic nets nightly is planned. A teletype connection is maintained with Chicago. LIN has 210 watts to a pair of 811s on 3735 kc. He will accept for delivery traffic for Waukegan, North Chicago, or Great Lakes Naval Training Center. GMV reports general attitude on OO work very good. SXL has biggest total since starting traffic. KA took part in the last Frequency Measuring Test and his measurements were the best he ever made. The following news came from the Society Radio Operators: The club house is at 4222 West Foster Ave., Chicago. Meetings are held the first and third Wednesdays of each month. New officers are: TXZ, pres.; SOZ, vice-pres.; BPM, secy.; AJC, treas.; WFX, chaplain; GAI, marshall. GAI also is editor of the *SRO News Letter*. The club has purchased a 167BY c.w. transmitter. The SRO picnic will be held at Orchard Grove on July 25th. The price — one greenback. SRO roster includes: RLZ, IR, ASI, SWO, GAI, TXZ, RMO, SOZ, BZT, BPM, RLM, GUH, QGZ, BLI, TRZ, EEH, KQT, LXD, QOM, IVB, QWP, BOM, LAB, AJC, LSQ, RHN, DOX, HXE, ES, EQJ, QVO, LOV, HTQ, KTL, QBJ, WFX, CGX, and 7RIA/9. CIA has FB postwar DX total of 153 countries with 600 watts. The Amateur Radio Club of the U. of Ill. and the Illinois Valley Radio Assn. recently were affiliated with ARRL. The Starved Rock Radio Club hamfest will be held June 6th at Camp Ki-Shau-Wau. The club is erecting two 90-ft. towers at the club house. BIN has new Class A ticket and worked KS4AI on 3.5 Mc. Some Illinois DX Contest Scores are: FJB 123,000, AEH 113,832, LM 108,486, ERU 82,000, GA 73,000, UNG 72,000, NII 66,000. Traffic: W9EVJ 635, VOA 332, KQL 312, SYZ 273, CTZ 145, PEK 139, SXL 134, ZPC 59, EEM 37, FKI 23, MRQ 21, NN 16, RSM 13, BIN 6, IFM 6, ASN 5, BUK 2, EBX 2, TAL 2.

INDIANA — SCM, Ted K. Clifton, W9SWH — SEC: WNM. QIN, 3656 kc. INP, 3905 kc. WNM asks that all holders of EE and AEC certificates or cards check expiration date and if necessary send them in for endorsement. BCJ has a new final using 813s with 900 watts input. FSG has been endorsed as SCM by the Indianapolis Club. IUM, of Auburn, is new OBS and sends official bulletins daily on 29,300 kc. at 6:00 P.M. CST. HNS, new president of the Indianapolis Club, has worked 39 states in four months and 5 VE districts using a 6L6 on 7-Mc. c.w. UDD spoke on "Grid Dip Oscillators" before the Fort Wayne Club on March 19th. DKV is Northeastern Indiana's newest and youngest amateur. Pete is 14 years old and has a Class B ticket. His equipment is an S40A and a BC-474A. Using a half-wave long wire he has worked ten states in six districts. KMY is at school in Milwaukee. CFI has a BC-696A on 3.85 Mc. and worked an XE. Look for an article by John T. Frye, EGV, soon to appear in "Today's Woman." QIB, of Indianapolis, has 109 countries and is closely followed by CKP of the same town. BZB has 79 countries and 31 zones. GXB is on 14-Mc. 'phone after two years of building. DPL, at Esse, called a trucking concern for a truck and trailer to haul over 3000 amplifiers to the N. Y. area. When the truck arrived he was surprised to find the driver was GGP. Capt. Robert Smith, XARC, in Trieste, is on 28,293 kc. and looking for contacts with Indianapolis 28-Mc. boys. HAR worked him using 30 watts. GPA is working for Allen B. DuMont Laboratories at Clifton, N. J. BKJ has a 40-ft. windmill. He still is complaining about small amount of publicity received by the 'phone net. The IRRC met in Indianapolis Apr. 18th. Watch for announcement of an Indiana get-together this summer. This is 73 for your present SCM. Next time it will be just plain old SWH who will say 73. Thanks for the swell coöperation, fellows, and I hope that you will continue to write me from time to time. Traffic: W9TT 139, NH 109, BCJ 88, YB 35, BKJ 31, UKT 18, KTX 17, PIQ 16, EGV 10, DOK 8, RE 6, HZB 4, RJU 4, DKV 1, UDD 1.

WISCONSIN — SCM, Reno W. Goetsch, W9RQM — It's a date — Sept. 4, 5, 6, — the National ARRL Convention in Milwaukee. It will be worth your while to secure advance registration. GPI is general chairman. Central Wisconsin Amateur Radio Club report is furnished by TOB, secy. Newly licensed at Wisconsin Rapids is DEB, age 15, now active on 3.5-Mc. c.w. ZSY has the DX bug. Central Wisconsin Club has 28-Mc. emergency net, which meets each Tuesday at 10 P.M. Racine Megacycle Club and Wisconsin Valley Radio Assn. are in the midst of Field Day preparations. BQP and CAI are new calls at Racine. PFH has a BC-453 working as a Q5-er. RPS and RMF increased power to 300 watts. VWQ is looking for Idaho and Nevada for 7-Mc. WAS. KZZ and BVG are using BC-453s as Q5-ers. HHM made a trip to the West Coast and reports many unusual 28-Mc. mobile contacts en route. UDU has been reinstated as Racine Megacycle Club call. Club activity plans include a 144-Mc. contest, emergency net, WAC and WAS contests, and a swell educational program. An outstanding job as OO is being done by CIH and he had an accuracy of .00017 per cent in the last FMT. QGQ is interested in EC activity. AFT is OPS and OES. KXK has 44 countries. SEC LZU is busy coördinating emergency planning and activity in the section and will be on the BEN regularly. RUF, Milwaukee EC, has 22 members active on 144-Mc. net. CFT and Wisconsin Valley Radio Assn. are providing super-service from the W9 QSL Bureau. Director ARE moved to R. 3, Marshfield, where he has a new antenna farm. LFK added Q5-er to receiver. DXV completed new half-kw. p.p. 813 rig. YCV rebuilt to 250-watt p.p. final. Traffic: W9LFK 223, ESJ 113, IQW 112, UFX 78, SZL 55, DXV 33, PIG 29, SIZ 24, CWZ 23, MUM 23, RQM 20, CBE 18, LKL 18, OAE 12, YCV/9 8, CIH 7, QJW 5, LZU 2.

DAKOTA DIVISION

NORTH DAKOTA — SCM, Paul M. Bossoletti, WØGZD — ZXT and HIV are new calls in Forx. RBS moved to Billings. ZRT donated his ranch and 160 acres to Cendak Club for a club house. Doc has been appointed Assistant Director. WFO has new 3.85-Mc. Zepp. VKB is new call at Grafton and AZV new station in Bismarck. TSN, Dakota Division Director, and a big turnout of eastern North Dakota hams attended Forx Club meeting. HGK moved to Park River and schedules GHN. MKD alleges he has received an SWL card from England reporting having heard him on 122.1 Mc. while he was running only ½-watt input. AZN is the first ham at Garrison Dam. GJJ has new FB 28-Mc. mobile rig. BIH, Aneta, is back on the air. CTS bought RBS radio service. GWU is back on from Forx. VAZ is rebuilding. 3.5-Mc. c.w. sounds good with all you boys coming back on the band for neighborly QSOs. Traffic: WØSSW 128, GZD 24, BCH 11.

SOUTH DAKOTA — SCM, J. S. Foasberg, WØNGM — SRX reports that the Yankton gang has several new prospects now up for exams. SRX, on 14 and 7 Mc. with 500 watts to an 810, has worked 61 countries since last fall. ION is on 14-Mc. 'phone. HJV is on 14-Mc. 'phone and has a new YL harmonic. SRX, ELV, and ION are installing a new 5-kw. transmitter at WNAX. RNN plans to have an AP reporter on the 3.85-Mc. net to get information to write a

(*Continued on page 80*)

SOLID AS A ROCK

Tens of thousands of PR Precision CRYSTALS in commercial service the world over are eloquent evidence that PRs STAY PUT! In aircraft, in the marine, in broadcast and point-to-point, in police and military installations . . . in fact, wherever frequencies MUST be in channel . . . you will find PRs on the job. PRs for commercial service are *precision made* . . . low drift cut for the utmost in stability . . . with temperature coefficient less than 2 cycles per megacycle per degree Centigrade . . . calibrated within .005 per cent of specified frequency . . . contamination and moisture-proof . . . weight less than ¾ ounce. Power output is exceptional, both for fundamental and harmonic oscillators. Since 1934 PR has become a standard of excellence for crystal controls . . . in all fields — commercial, amateur and industrial. It's no wonder that amateurs prefer PRs in their rigs at all frequencies. Use PR and KNOW WHERE YOU ARE!—Petersen Radio Company, Inc., 2800 W. Broadway, Council Bluffs, Ia.

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feature story. QVY reports that MNI, marine mobile aboard the SS *Cedar Breaks*, looks forward to his return to South Dakota. Rapid City's youngest ham is GFG, who is 13 years old. New stations on from Rapid City are GCW, with a new kw. rig; YOB, on 28-Mc. 'phone; and QHX and SKM on 28-Mc. 'phone. GLA is SEC and drills are being held in the Hills. GCP, the RM, is doing yoeman duty. HDO is OPS. YPC has his Class A ticket and is looking for a modulator. Traffic: WØBLK 37, GCP 28, PHR 17.

MINNESOTA — SCM, Walter G. Hasskamp, WØCWB — RJF is really after traffic; by using a BC-696 VFO he regularly reports into MSN, QMW, and Trunk Line "G," and other Trunk Lines when necessary. JNC is putting up rotary beams for DXCC. The gang at Rochester now totals 35, an increase of 12 over last year. The 28-Mc. net of six members is going strong each night. UWG is back on 3.85 Mc. after a long absence and will soon have a kw. there. GUL has a new rig — 400 watts c.w. and 300 on 'phone. JDO visited WAO, TPN, and UWG. GPQ is working on a new VFO. RAJ's shack is getting its face lifted. HFB is a new call at Albert Lea, bringing the ham population there up to 5. FIT is increasing power. YUN is QRL with television studies. IRM is working on a 28-Mc. converter using a grounded grid r.f. stage. MTH is back on the air using a Navy GL9 transmitter. The most important of ZWW's latest acquisitions is an XYL. Ole Uncle FUZ, one of our ex-SCMs, plans to be in Bemidji this summer. Watch the increase in 144-Mc. work around the twin cities! Thirty BC-522s have been purchased in that area recently. Do you want a frequency check down to the last cycle? YBM has completed an audio oscillator used in conjunction with his frequency measurement equipment and is reading 'em way down fine. JDO and ZRT are now assistants to our Director, TSN. Visitors of the SCM were ZOB, YKD, and 8UWW. PSD received his Code Proficiency Certificate for 25 w.p.m. MQX, now in New Jersey, keeps 7-Mc. schedules with WJA. High winds spelled doom to many antennas, including the tower of JHS, the v.h.f. boy. EPJ's three-element beam was converted into an "engineer's nightmare" and HZR's vertical is now horizontally polarized! YDB is getting a new beam custom-built by Honeywell. New issues in Minneapolis are GOP and HAM. Hope to see many of you at the GO-PHER Hamfest at the Nicollet Hotel, Minneapolis, on June 18–19. Traffic: WØRJF 148, VJH 114, ITQ 83, CWB 61, HEO 31, RPT 30, GKC 24, YBM 23, JIE 21, ORJ 12, CCF 11, YUN 11, JRI 9, BGY 7, JNC 7, FIT 5, HEN 4.

DELTA DIVISION

LOUISIANA — SCM, W. J. Wilkinson, jr., W5VT — Your SEC is KTE. Jim will be glad to hear from everyone interested in emergency operation. CEW, the PAM, has just about completed his collection of QSLs for DXCC. Who wants the appointment as Route Manager? The section needs a good one. HOU has become quite an expert at measuring frequency. Consequently Bob has a brand-new OO Certificate. NBK is new ORS. JRI is engaged in rebuilding his kilowatt. JWI got the bug (a bad milliammeter) from his final. KRS is in line for appointment as Class II Official Observer. JET has been helping would-be hams with their studies for the exam. OIN has just received his ticket and is active on 7 Mc. IVT is on 28 Mc. with new beam. IUG has been QSP on 3.85-Mc. 'phone. FRM reports 50-Mc. activity is increasing. JBW has VHF-152 for 50 Mc. MJT had such bad luck with his rig that he has started rebuilding. KRX represents Baton Rouge on the Rebel Net. CGC is knocking off the DX on 14 Mc. BSR has been active on 3.5 and 3.9 Mc. Vic hopes his efforts as Director has met with the approval of all and he intends to continue his policy of representing this division in a manner which will be to the best interest of ham radio. This will be the final report for the term of office as SCM which ended on April 15. May I extend my appreciation to all who have assisted in making it a pleasure to serve. Traffic: W5KTE 111, VT 7, IUG 5.

MISSISSIPPI — SCM, Harold Day, W5IGW — SEC: JHS. RM: WZ. PAM: LN. HEJ sends dope on the Natchez gang. HEK has Class A ticket now. HEF has his revamped rig on 3.85 Mc. KHB has a new three-element beam on 28 Mc. and is working his share of DX. JUJ is active on 28 Mc. IGD is moving his QTH to a northern climate. LN, NCS for the Mississippi 3.85-Mc. 'phone emergency net, passed out some nice Section Net Certificates to the members of the Net. OAY is a new ham at Starkville, and is running 25 watts on 7 Mc. LAK now has WAC, and has worked 62 countries. LEA is running 600 watts on 3.85-Mc. 'phone. AHA is working 28 Mc. with a three-element beam. EGE is as regular as the sun on the Rebel Net. Fellows, I wish you could read some of the nice bulletins received from several places and see what a swell job the OOs are doing in those places. We are in dire need of two good OOs in our section. Traffic: W5IGW 81, WZ 43, LAK, 41 EGE 25.

TENNESSEE — SCM, Ward Buhrman, W4QT — KMH is new PAM. ZZ regained prewar call, ABR, for use at Knoxville. Amateur Radio Society of Union University, Jackson, reports AQV is new president. Other officers are: TM, vice-pres.; Wm. Wilcox, secy.; Ed Bivens, treas. AQV is Jackson EC. SW, GLL, and CTW attended the IRE Convention. The Memphis club has emergency portables on 7 and 3.5 Mc. DIY has Marine rig. LVW operates 28-Mc. mobile. VT discoursed on grid dip meter before Memphis club. FCF has smooth power control from 100 to 1000 watts. AAW is erecting new antennas. AFR is skeptical of underground antennas. DDF, new QSL Manager, wants envelopes (with stamps!) from DX gang. He would like to deliver several thousand cards, some dating back to 1935. The gang appreciates the fine service given by MS, former QSL Manager. 50- and 144-Mc. enthusiasts include LQE, GXX, MOV, and FWH. Nashville's *Bandspread* is a popular publication. HOJ says Q5-er rejuvenated prewar receiver. He runs 500 watts on three c.w. bands. EUT and ETN have combined forces, using the call ETN. EUT will soon have 813 on 28-, 14-, and 3.85-Mc. 'phone. FLS got that new beam warmed up on 14-Mc. 'phone and worked WAC in about three hours. MZK replaced beam lost in storm. KG6DG is a Chattanoogan on Guam looking for home area on 14-Mc. c.w. Traffic: W4PL 657, BBT 89, CZL 28, ETN 24, DIY 22, HOJ 13.

GREAT LAKES DIVISION

KENTUCKY — SCM, W. C. Alcock, W4CDA — The Kentucky C.W. Net (KYN) operates daily 7 P.M. (CST) and 9 A.M. Sundays, with 15 towns represented. KYP ('phone) is trying 10 P.M. daily schedule on 3955 kc. Nets will suspend for the summer June 1. FBJ is building 24-element beam, working with BPE on organizing KYE (Ky. Emergency) Net on 145.8 Mc. BPE is trying 2300-Mc. cavities. MDB and KFI are new men on 144 Mc. ALR is coming to life with Federal 167-BY rig. BEW, at Ashland, is Kentucky's new SEC. All interested in Emergency Corps work, should contact him. KZF is using converted SCR-522 on 28 Mc. KVX made 32,364 points in DX Test. KTC's new address is Erlanger. FR is equipped to give accurate frequency checks. JCN is experimenting with 803 amplifier. CDA is going old-fashioned with 50-T. TXC is doing brain work on s.s.s.c. FQQ wants radio-schedule time off to go fishing. JRO has new BC-457A VFO on 3.5 Mc. LUR worked European DX on his HT-9 on 28 Mc. FKM was on KYPhone Net for 100 per cent attendance. MSC works N.C. net occasionally. HAV has been appointed Official Phone Station. NBZ, a newcomer, uses BC-459A, and wants 750 volts for his 1625s. JHU is going to remodel house with shack in the attic. He advises the gang to get ready for the Mammoth Cave Hamfest. BAZ is getting rigs in good operating shape. MWM, licensed in December, has 6L6-807 rig underway. Traffic: W4BAZ 138, YPR 70, TXC 66, FBJ 65, JCN 56, FKM 39, FQQ 30, CDA 24, MWX 23, MMY 20, FR 15, MSC 12, PWB 4, HAV 1, JRO 1.

MICHIGAN — SCM, Joseph R. Beljan, jr., W8SCW — SEC: PVB. RMs: NOH, PVB, and UKV. PAM: YNG. Section Net Certificates have been issued to AIZ, CPY, DWB, GLW, HM, IAE, LKV, LR, LU, MLD, QAM, QPO, TBP, TCY, TDO, TQP, VJI, YFI, ZBT, ZRW, and ZUL. Congrats to the Adrian Club on its affiliation with the ARRL. The Allegan Club has been recommended for affiliation. The Catalpa Amateur Radio Society is a newly-organized club in Southern Oakland County. The Jackson Club elected WW, pres.; JSK, vice-pres.; UCA, secy.; and BIJ, treas. ZNI is Field Day chairman and WKJ is club EC. UKB is operating portable from Schenectady, N. Y. ARJ is running 125 watts to an 812. YCJ has new Sonar exciter and is operating on 28 Mc. TCY is with CAA at Lansing and reports into the BR, MEN, and QMN Nets. MM has completed his new shack. UJE has added a Q5-er to his NC-173. SMO is operating 28-Mc. mobile and uses a Collins 32V-1 at his home station. SWG is on 27 Mc. and complains that HP steals contacts from him. PXR is using a "fisherman's portable" on 3.85 Mc. with eight watts input. ARR is active on the QPO Net. NQ is operating portable on 7 Mc. with a Command transmitter. AYV and HEX are building portable-mobile equipment. YKP is putting his 167BY on the air. TBP is planning on 304s in a new final. YMG has a new RME-45. TIC has added a Panadapter to go with his SX-43. 9DMW/8 is operating portable-mobile around Detroit and is planning a pair of 826s for his home rig. AFH is building wide-band f.m. for 53 Mc. GNJ, MM, and IAE are on 144 Mc. QFF worked his first G. QH finally made WAC on 14 Mc. WXO reports the Flint gang did some fine EC work during the recent flood. ZCI is VFO and operates the college station, SH, on QMN. DWB is planning on a pair of 809s. WOV made WAS on 7 Mc. and is now RCC. AQA is running a half kw. to a pair of VT-127As modulated with a pair of 838s. KOS is planning on 14-Mc. f.m. UES is planning a special rig for QMN with 200 watts input. RTN is operating 144-Mc. mobile until settled at new QTH. The Allegan Club is settled in new club house. Traffic: (Feb.) W8GJX 112, YNG 52, ZRW 15, AYV 9, ARR 8, DED 6. (Mar.) W8ARJ 304, SCW 264, TBP 233, IHR 219, GSJ 208, UKV 121, NOH 101, TRN 63, CPY 54, TDO 44, TQP 32, IV 30, QBO 29, CYH 27, ATB 25, WOV 25, UUS 23, KOS 22, UES 22, AQA 21, YAO 21, DWB 17, RJC 17, RTN 13, SZW 11, QF 10, EGI 9, FX 8, HM 7, UGR 4, BCX 2, RYP 2.

OHIO — SCM, William D. Montgomery, W8PNQ — Reports this month came from 31 amateurs. The traffic

(*Continued on page 82*)

India chooses COLLINS Radio

Collins 20T

Sangamo Type G Mica Capacitors are used extensively in Collins Transmitters.

The India Supply Mission has purchased fifteen 1,000 watt broadcast transmitters and all associated station equipment from the Collins Radio Company, Cedar Rapids, Iowa. This equipment will be used by the All-India Radio, the new Indian (not including Pakistan) government's broadcast chain. The 15 new Collins-equipped stations will be situated in areas not already served by All-India Radio. They will implement the new government's policy of taking radio to all people, wherever they live. The government also supplies and operates radio receivers in public places for those who cannot afford radios in their own homes. Interested groups, gathered around publicly owned loud speakers, are a common sight in India.

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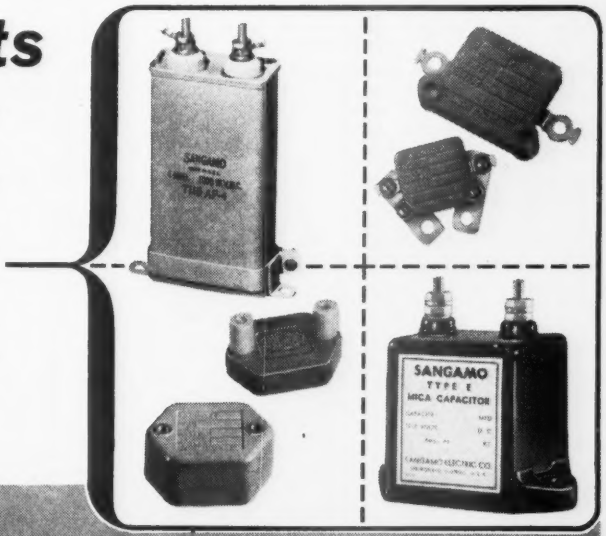
Yes sir, quality counts in ham radio as well as in the professional field. Play safe . . . insist on Sangamo Capacitors and get high-quality, precision-built capacitors that will keep your rig on the air and give top-notch performance. Get acquainted with the Sangamo line today. Your jobber can supply you.



SC485

SANGAMO

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

total was 1525, which is fine business. Recent appointments include PNY as ORS, LBH as OBS, and EOO as EC for Belmont County. We see by the newspaper that PGR obtained medical advice via the HOOT OWL Net from Doc 4INY, which enabled him to give emergency treatment to his wife until a doctor could be located in the vicinity. From the Dayton Amateur Radio Assn. *Bulletin*, we see that CEC has the unique distinction of having taken (and passed) the Class B license exam twice in one day, and in different cities, too. When he took the exam in Cincinnati the R.I. somehow lost the paper. To make up for it the R.I. looked up CEC in Dayton that evening and gave him the exam again. It was Inspector Oakes of the Detroit office who was kind enough to do this for Jim. From the *Central Ohio Radio Club News*, we see that WZ has a new Collins 75A receiver and that NPF has recovered nicely from an appendectomy. From the *Q-5* we note that visitors at the March Springfield Amateur Radio Club meeting included out-of-towners TDI, HHR, TRT, RHG, and 2NIO. From the *MIKE AND KEY*, we find that the new officers of the Greater Cincinnati Amateur Radio Assn. are: PR, pres.; 4HAV, vice-pres.; MGR, secy.; NDN, treas. We note also the new streamlined appearance of the paper, which is now printed professionally (Planographed), allowing the use of photographs. The editor, MGR, is doing a fine job on the paper. A recent Class A ticket is that of LBH. DAE made WAC in 5 hours 29 minutes on Feb. 14, which to us seems pretty good since we have been trying for years to make WAC and have not succeeded. JFC worked MI3ZJ on 28-Mc. 'phone during the DX Contest. THJ says that the Piqua Radio Club now has a 1500-watt emergency gasoline generator available and ready to go at the first sign of an emergency. WAB reports that EYE is conducting code practice on 28 Mc. on Tuesdays and Thursdays at 8 P.M. in Columbus. PUN worked ZL2BE on 3.85-Mc. 'phone March 15th. PTF was appointed chairman of Montgomery County Red Cross Communications Committee following the resignation of CBI from this post. Glad to hear that CNO, Mrs. Thomas, a real old-timer, had her ticket renewed and hopes to be back on the air in the near future. BYE is a new ham in Delaware. WRN reports that ZHS, an active 144-Mc. man, has moved to Florida. In closing, I wonder how the Ohio Council of Clubs is progressing. I have not had a single report from them since their organizational meeting some time ago. Traffic: W8TKS 317, RN 174, UPB 159, FFK 156, CBI 128, EBJ 104, PZA 86, TAQ 49, WE 49, UZJ 46, PNY 44, ZAU 42, PUN 28, TNB 24, WXA 24, LJH 21, WAB 18, PIH 17, EIU 11, QIE 8, THJ 6, BEW 5, AQ 2, DAE 2, JFC 2, UW 2, NDN 1.

HUDSON DIVISION

EASTERN NEW YORK — SCM, Ernest E. George, W2HZL — The New York State Traffic & Emergency Net has added USH, SXR, JPE, WEK, GSB, and SUL to its membership. The net now consists of 32 members and 41 outside stations actively participating — an excellent performance. BSH reports his new VFO is working fine into his 300 watts with excellent operation into West Coast on 3.5 Mc. TDT, secretary pro tem of the Mid-Hudson Amateur Radio Club, reports the club is preparing for the radio end of communications for the Albany to New York outboard motor boat races. EQD is busy organizing emergency net systems. Our nets have been drilling with N.Y.C. and Hartford groups and have run off a 144-Mc.-3.5-Mc. relay set-up N.Y.C. to Binghamton. RH is net control station in Westchester. NVB is operating K2NAD, Naval Reserve station in New Rochelle, in the net. SYA donated a fine emergency power supply to the Amsterdam Radio Club. The club is gathering books on the subject of radio to donate to the library to supplement their supply. It comes out that TJE comes from a long line of hams, his father being an old spark addict of 1907. Appointments this month: ECs: SUL and WIK. OES: TDT. ORS: BSH. Traffic: W2ITX 247, BSH 16.

NEW YORK CITY & LONG ISLAND — SCM, Charles Ham, jr., W2KDC — Suffolk: A small group holds regular drills on 144 Mc. weekly. UGH is going to boost his 3.5-Mc. c.w. output with a pair of 809s. PIA has a 144-Mc. beam rotating with his 28-Mc. antenna. ZV rarely misses a day on either 3.8-Mc. 'phone or 3.5-Mc. c.w. MZB has joined the 144-Mc. gang with a 522. EBT is getting another 522 in shape for the car. WLS is on 420 Mc. with r.f. units from an APS-13. WXJ joins the gang. ADW is on 28 Mc. with 90 watts to an 829B. From his new QTH in Oakdale EDF is on 28 Mc. OQI gets on 144 and 3.5 Mc. Nassau: With an average of 27 stations active on regular drills on 144 Mc. the Nassau gang heads the section. Those active during March were: CMU, FQW, IER, UOL, MBB, VL, SFV, CET, GG, QBS, OBH, GQP, SPI, TVX, RZ, CHK, IGP, ANN, SMX, JPV, CB, WKR, LPJ, HOL, FI, NI, WJS, RH, QAN, VQY, ADT, OXM, OUQ, and NBQ. Regular drills include QSP traffic from Nassau to the Monmouth County, N. J., AEC Net. Brooklyn: NXT got going with a.m. on 144 Mc.; KU doubled the number of elements in his beam to eight with the assistance of HG. JSJ is back on 144 Mc. with a sixteen-element beam. WLI, UQA, and EYD are recent additions to the 144-Mc. AEC Net. EPF is active on 144 Mc. OHE is equipped with both vertical and horizontal beams for 144 Mc. 80 C.W. Net: PVR, UCB, and QBS are new additions to the 80 C.W. AEC Net. UZX and KTF, NCS of Groups One and Two, respectively, keep things active with two regular drills per week. During the past month simulated emergency tests were held with the assistance of the gang in the Triple Cities (Binghamton, Johnson City, and Endicott, N.Y.), with traffic being moved swiftly from 144 Mc. Net in N.Y.C. via 3.5-Mc. c.w. with EQD and FCG as 3.5 Mc. liaison stations. All 3.5-Mc. c.w. stations are invited to tune to 3600 kc. any night at 8 o'clock. AEC picnic will be held June 27th at Bethpage S.P. Queens: NZJ is giving his time to the AEC Net on 144 Mc. KDB is reporting into the 80 C.W. Net. WFY has new VFO. The Sunrise RC is changing operating time from 1030 to 0800. WHB is secretary of the Trylon RC, which meets at 63–44 Wetherole St., Rego Park, the last Tuesday of each month. OG is on 144 Mc. The Staten Island Amateur Radio Association reports the club net meets the 2nd and 4th Mondays on 29.6 Mc. at 2100. At present AMO, GHK, JLC, KZU, PZP, and VJU are reporting. ACZ and AMO are on 3.8-, 29-, and 144-Mc. 'phone. CQR is prettying up a 522 for 144 Mc. GHT and WNW are working on 522s. NHB, ORB, and PRP concentrate on 28 Mc. PZP and RVL are working on 235- and 450-Mc. gear. SGO is on 7 Mc. VJU is really high — on 3000 Mc. no less! VYY pounds brass on 14 and 7 Mc. WOZ is on 28-Mc. 'phone. The Federation of L.I. RC hamfest is scheduled for Nov. 12th. MSK is giving code practice at 1930 on 29,076 kc. RT has new Temco rig. VVN will operate portable on 28 Mc. this summer and wants schedules. Contact him at 574 W. End Ave., N.Y.C. 24. PWJ is on 3914 kc. from 1000 to 1600 daily. UZX, QYZ's assistant, has completed a 304TH rig. BO will take traffic for direct contact with Alaska and South Pacific. HXT finally made 100 countries. EC says TL "AP" will be discontinued for the summer. RTZ schedules 6YDO/2. TUK got on 14 Mc. with converted 459A and finally worked KDC on 3.8-Mc. 'phone. BGO handled some Central States tornado traffic. VVZ has a rotating double triplex beam. GG is trustee of YKQ, Lake Success RC station. Traffic: W2TYU 840, QYZ 531, 6YDO/2 226, W2RTZ 157, OBU 143, UZX 128, TUK 126, BO 99, EC 91, KV4AF/2 84, W2VOS 83, BGO 60, MJO 58, OUT 57, LGK 36, KDC 35, RQJ 16, PWJ 14, HXT 10, AYJ 4.

NORTHERN NEW JERSEY — SCM, John J. Vitale, W2IIN — Asst. SCM, 2ANW. NNJ Net (c.w.) 3630 kc. 7 P.M. daily except Sunday. N.J. 75-Meter 'Phone Net 9 A.M. Sunday. Tri-County Radio Assn., Plainfield, devoted its last meeting to emergency operation. Speakers were IIN and ANW. The club meets every Monday at 8:30 P.M. at City Hall. Officers are BU, pres.; QJR, vice-pres.; MGF, treas.; KHK, secy. Field Day teams are testing gear for the big day. The Monmouth County AEC Emergency Net holds drills every Monday at 8:00 P.M., under the leadership of County Coördinator VQR, with as many stations as 40 reporting in. APL received his A-1 and RCC sheepskins. OCC and QMZ soon will be signing /4. UYY is on 144 Mc. UWN is putting up six-element beam on 144 Mc. UZK and UNA are putting up sixteen-element beams for 144 Mc. YCS is on 144 Mc. with 522. Operators at OEC are QEM and SLW. QUH now is 6COD. QZF is new member of 75 Meter 'Phone Net. CWK has 80 countries on 3.5 Mc. OXL is increasing power and changing to VFO. ZI and SUG were guests at the recent NNJ meeting. NNJ Net will be on summer schedule from June 1 until Sept. 15. BGH is assisting LFR in AEC work upstate. Hal is on 144 Mc. with a 522. CYE has new exciter. OSQ has been appointed Acting Coördinator for Union County. UWK put up new antenna, six-element Sterba Curtain. NIY schedules 7BE daily. ANW won the latest F.M. Test clock. UCARA is on the air with its new call, GIZ, dedicated as a Memorial Station to the late Carl F. Mueller, who was vice-president at the time he passed on. With the 522 on 144 Mc., the transmitter was converted by PIX and PIY, the receiver was changed over by John Baird, club member, and the coaxial antenna was installed by EIU, chairman of the technical committee, above the roof of the three-story Headquarters Building of the Elizabethtown Chapter, American Red Cross, where the station is located and where meetings are held every Monday night. Mrs. Mueller has dedicated the use of Carl's complete station to the Memorial and the club is going to put it on all of the lower frequency bands. MUP was chairman of the Dedication and Memorial Dinner which was held at the Elizabeth YMCA Apr. 17th. 1IIN, from Headquarters, represented ARRL. PIX, the president, presented Mrs. Mueller with a Life Honorary Membership. MUP presented her with the club's resolution on a beautiful handmade scroll. IIN presented the Past Officers' Keys to MUP, NKD, LIQ, PIX, and Mrs. Mueller for GIZ. New ECs are CIU, Avenel; BTZ, Rahway; AUI, Woodbridge; DFV, Fords; IZC, Cranford; 5UD/2, Eatontown; DME, Atlantic Highlands; NIE, Interlaken; OOC, Sea Girt; NUL, Passaic County; ZL, Avon. BTZ is OPS. OSQ is organizing the Union County Emergency Net on 144 Mc. with tie-in on 28 Mc. The UCARA-RC Net is running on 144.138 Mc. Sun. 11 A.M. with GIZ as NCS and PIY in charge. Traffic: W2CGG 345, OEC 138, DRV 112, CQB 111, NKD 108, ANW 96, LFR 86, NIY 74, MTV 53, BLS 49, BZJ 26, QEM 23, APL 20, CJX 16, BRC 10, KMK 10, UWK 10, OXL 9, IIN 8, QMZ 8, ANG 6, CWK 5, TRN 5.

(*Continued on page 84*)

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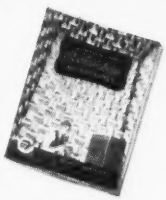

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MIDWEST DIVISION

IOWA — SCM, William G. Davis, WØPP — IFI is recuperating from a heart attack. JUI is now up and around after a siege of the same trouble. TJC has new 400-watter going. HRM is new ham at Linn Grove. SEF operates on 14 Mc. part time. Ex-FSH now is GZ. WMP made WAC with his new p.p. 813 final. AYC is building new exciter. PP was reëlected to town council. EBK, of Clear Lake, is on 3.85-Mc. 'phone. LAC has outstanding EC set-up in Burlington. HKN had a fire in his rig. NMA is keeping contact with Iowa Net with one of two rigs set up in his CAA truck. SWI is new EC for Cedar Rapids. DEA, Midwest Division Director; PP, Iowa SCM; and FP, Iowa SEC, attended Cedar Rapids Radio Club meeting May 12th. WMU reports working HB9CS for solid ten minutes on TLCN net frequency 3560 kc. using BC-349. He has a new Federal 167-BY which he expects to have on the air soon. Trunk Line "K," under the management of HMM, began operation March 9th. Trunk Line "K" consists of EVJ, HMM, ARH, and 5LSN. AAL sees possibilities for portable 28-Mc. rig on tractor. OSC, Storm Lake, is on TLCN. TTL is on 144 Mc. with 100THs. AEH, TIO, CHI, NFM, and WCC were heard by TTL on 144 Mc. OTD, Nevada, is going to high power on 144 Mc. with 829B. AEH hears WHZ, who uses a vertical on 144 Mc. SQQ is EC for Adel and vicinity. NAY has applied for EC for Bloomfield area. CVU broke out 654 and set 3970 kc. upside down in the Middlewest. Traffic: WØHMM 1056, FP 44, CNK 36, PP 28, AYC 25, QVA 24, SEF 21, OSC 20, TJC 17, FKB 15, NMA 2.

KANSAS — SCM, Alvin B. Unruh, WØAWP — All Kansas Emergency Coördinators have been given added responsibility by decreasing zones from 33 to 22 and streamlining the set-up. ECs plus RMs, PAM, etc., meet the first Saturday of each month. Assistant ECs are invited to take part. OZK is EC for new Zone 10 — Cowley, Sumner, and Harper Counties. ZOC and AHA joined AEC. ZOC is new ORS and has pair of 807s driven by BC-457 and BC-458. OHX says 3.5-Mc. rig is ready to go, and reports VZL has kw. IZJ has ARC-5 144-Mc. rig. CUL reports eight members in N.W. Kansas. (EC Zone 21.) CXF has schedules with VP4TU and W5EUF/KH6. AHA is on slow speed trunk line and handled more traffic. He also has schedules with W5 and W9. AHM is looking for schedules with chess players. Engineers of the telephone company gave a lecture and demonstration of their mobile two-way telephone at a joint meeting of the Wichita Amateur Radio Club and AIEE chapter. Well over 100 were present. DWC, OKD, MAR, and AWP have BC-453 Q5-ers and report ham bands have widened considerably. OZF and ZUA were Wichita visitors. KSY reported into QKS Net from FER, Hays, who has VFO going. MKR is active at El Dorado with 800 watts. Traffic: WØPZP 114, NJS 36, AWP 35, IFR 22, CXF 20, WKA 20, AHA 16, OUU 14, CUL 8, FER 8, ZOC 7, FRK 6, AHM 5, JTN 4, AEY 2.

MISSOURI — SCM, Mrs. Letha A. Dangerfield, WØOUD — ARH started building a table rack with a pair of 1625As and VRX680 exciter and burned out his antenna relay. The Columbia boys piled up a lot of traffic with the St. Patrick's Day celebration at the Eng. School. The boys are taking turns reporting on MON. The regulars are CKS, GEP, JSR, and ZZW and the club station, ZLN. JSR is putting up new 3.5-Mc. antenna. JHH has a Stancor 60N. PXW has an 813 on 3.85 Mc. and a BC-459 on 7 Mc. AFU is a new ham on 7 and 3.5 Mc. NNH heard the Hallicrafters Expedition twice while it was in the mountains. RAB and HDK have a new Stancor 202A with 125 watts on 3.85, 14, and 28 Mc. and RAB worked 28 other YLs since January. FSI likes traffic work. He says the St. Joseph Club has been reactivated. The Springfield club has been affiliated with ARRL. VMO burned out a bias supply. Director DEA has received replies from 25 per cent of those he polled. Correction on that Mo. 'Phone Net — it is 3903 kc. KSR is NCS. VMI's gang did fine work in the Bonne Terre disaster recently. Five of the boys went to the scene and used the call KSR/Ø while many others relayed traffic from their home stations. There were nice write-ups in the papers. The only calls I know are OMG and QMF. OUD has better signal reports since DE added more wire to the antenna and ran it around a couple of more corners. ZAO proposes shifting the Mo. c.w. emergency frequency to 3650/7180 kc. to make it more usable both night and day. INK had a personal emergency when he ran into a clothesline in his eagerness to report an SOS to the Patrol. Traffic: WØARH 306, QXO 216, SKA 138, GEP 58, ZZW 57, OUD 56, KIK 49, JSR 39, VMO 33, CMH 31, CKS 30, FSI 27, KSR 23, DEA 21, NNH 21, VMI 11, UHR 8, ZAO 8, TAB 6, HDK 3, PXW 2.

NEBRASKA — SCM, William T. Gemmer, WØRQK — DJB, FAM, LJO, YCG, and WII/Ø are new ORS appointments. MZM is looking for the "ole 160 gang" from a new QTH, Wakefield. BQP is now 9DFM and operates around 7241 kc. ZTE's 3.85-Mc. vertical and SAI's mast blew down during the March winds. SAI has a 60-footer lined up for replacement. TYG is on 28 Mc. with 200 watts to an 813. DHO is using a Globe King while rebuilding his T-55 rig. LEF raised a 35-footer. HSO had to trade in GTW for present call. Fifteen Hasting Radio Club members, their wives, and several Grand Island hams, visited the monitoring station. SEC MLB says, "The MARC will be in the Field Day contest 100 per cent with four transmitters in operation. HVX is new ham in Kearney. FJU and MLB are on 144 Mc. MLB has new HRO 7." Twenty-nine hams attended the reorganization of the Western Nebraska Amateur Radio Club at Gering. RGK, LWS, and RYV are president, vice-president, and secretary, respectively. MGV gave a fine talk on s.s.s.c. and held a discussion on oscillographs. A fine time was had by all as can be vouched for by CVC, UBN, and your SCM, who represented the North Platte gang. The group will participate in Field Day. DJB is on with a BC-610 and SX-28. LJO has a pair of 811s perking on 3.5-28-Mc. c.w. and 'phone. RGK is using a 304 with a full gallon. NVE and VMP will be on Field Day with BC-654. Traffic: WØFAM 198, SAI 48, FQB 45, HSO 15, YCG 15, FBK 8, NVE 4, DHO 2, WVE 2.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Walter L. Glover, W1VB — Two new clubs were organized recently: The Mattatuck Amateur Radio Society of Waterbury, and the Meriden Amateur Radio Club. Officers of MARS are OMW, pres.; IZG, secy. and treas. Officers of MARC are FYG, pres.; HVF, vice-pres.; QPD, secy.; NRG, treas. JE of Worcester, Mass., is looking for a Connecticut station for the Swing Shift Net at 12:30 P.M. BAX, DJC, and LMK visited CQ Radio Club meeting. CQ has received the call RBS. ITM has a new jr. operator. Bob Perry, of Stratford, passed exam with call RBP. ON and LVQ made Class I OO in January FMT. BHM reports over one hundred countries worked. AW has new operator Dick Eidel, 2MHW. 9BRD/1 has 30 countries with indoor antenna. NJM attended Old Timers Night in Trenton, Mar. 27. Joe Dietz is waiting for call after taking the exam. KUN and KUO went down for their Class A tickets. IGT received appointment as EC for New Haven. ADW has new VFO working. HCARA conducted a Red Cross drill on Mar. 21st with 25 members and 7 mobile rigs participating, and got a nice write-up in the local paper. DWP is finishing his rotary now that good WX is here. LKF has CRN Net in operation. All clubs seem to be making big plans for Field Day June 12th and 13th. As per the change in rules, please address your messages to your SEC, VW, 41 Middlefield Drive, West Hartford. NARL held an AEC drill with New York City Feb. 8. DXT rebuilt BC-654 for VFO. NJM converted an ARC-5 for the same purpose. HUM received ORS appointment, and reports into Nutmeg Net. VW, as OO, reports logging 42 c.w. and 39 'phone stations out of band during DX Contest. We also notice considerable reports from OOs on 2nd harmonics of 3.5-Mc. band. Better check, fellows, before the FCC does. Traffic: W1AW 279, DAV 253, EFW 220, LKF 161, VB 138, NJM 131, INF 119, KUO 77, ORP 61, BDI 42, FTX 33, ADW 13, CTI 12, DXT 9, DWP 3, BGJ 2.

MAINE — SCM, F. Norman Davis, W1GKJ — SEC: LNI. RM: NXX. PAM: FBJ. New OPS: VV. New ORS: KYO. RBD is new amateur in Wilton. NXX has an SCR-522; he also sends code practice daily at 7:30 P.M. between 3500 and 3550 kc., the exact frequency determined by interference in this region! LKP and ODA are doing fine job as links between S.G.N. and P.T.N. for clearing traffic. NKM has acquired an SCR-522 and a BC-696. QIQ now operates from K1NAD. JAS is at Duck Pond for the summer. The column "With the Radio Amateur," written by VV, is without doubt the best publicity New England amateurs receive. Don't fail to read it in the *Portland Sunday Telegram*. KYO has new NC-173 and his XYL is learning the code. AWQ is on 3.85-Mc. 'phone. QUA has worked half the states on 3.5-Mc. c.w. and he is running only four watts. If all the boys that are bearing down at the code and theory classes held at the PAWA pass their exams we should be hearing quite a few new calls in Portland and vicinity soon. Field Day is coming up; get your batteries charged and let us hope the weather is better than last year! How about more reports on the first of the month? Traffic: W1NXX 60, OHY 60, LKP 44, GKJ 41, POD 36, OHT 31, QHA 28, JAS 24, TO 19, AWN 17, VV 15, AFT 9, KEZ 8, PTL 8, KYO 3, KVI 2.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — New EC for Beverly is BVL. WU and QJB are new ORS. BGW is a new OO, Class I. NF, GGV, and AYG renewed OO appointments, HOB his OPS, and JXH his EC. MMH has applied for OES appointment. CTR is on 144 Mc. ALP is on 144 Mc. with a 522. AKY's brother in Sweden is SM5APF. AWA, HHW, and PWP are on 3.9 Mc. Sorry to have to report the death of OTO. PEK, from ARRL, and ALP attended meeting of South Eastern Mass. ARA in New Bedford. 8WGF/1, PHA, VX, NDI, NAD, and ORT are on 144 Mc. MEV has a sharp Superhet on 144 Mc. QQL, QPB, QZO, QJS, and JOY are on 144 Mc. Plymouth Amateur Radio Club now is affiliated with ARRL. The Sub Signal Radio Club had dinner, movies, and a radio quiz by KAE. KNI reports numerous QSOs with BZN on 420 Mc. KNI, NF, and BZN have 2300-Mc. cavity oscillators. MCR has the following reporting in on EC drills: AKD, KSA, MUD, NWB, OKK, OTZ, PXH, QHC, and QJK on 144 Mc. BUG is building kw. final for 28 Mc. QMD has new dipole on 28 Mc. LMU reports the following are on the Newton Emergency Net: BL, EK, EYI, HLX, OIW,

(*Continued on page 86*)

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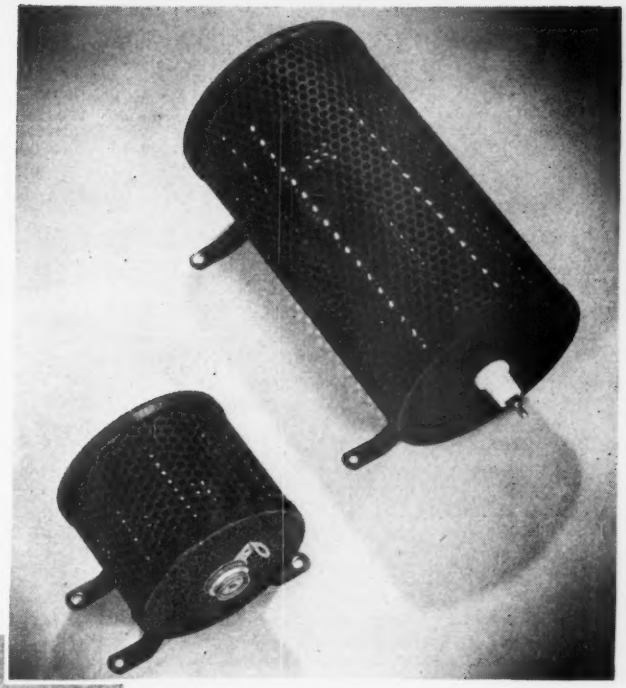

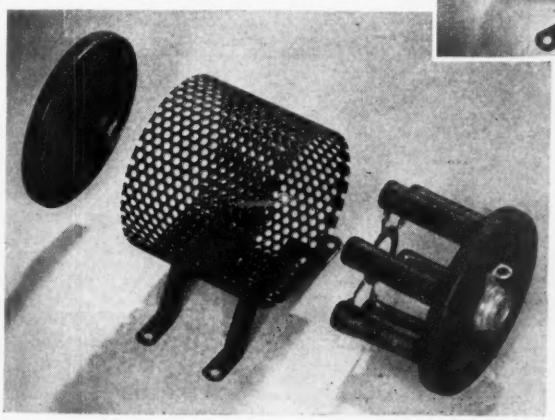

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OMU, PX, and RM. Newton ARA is going to renew call NPA. BR put 6AK5s in his 522 receiver. LMU has 522 receiver finished. GGV has n.f.m. job ready for 27-30 Mc. Eastern Mass. ARA had AKY as auctioneer, and JC of FCC gave a talk. Brockton Radio Club had beam rotator exhibit, 522 conversion and high-frequency signal generator demonstration. T-9 Radio Club met at IBF's and had election of officers. OLP gave a talk on radar at South Shore Radio Club. OBN worked 7KL with 8 watts. MRQ got QSL card from Gold Coast. NLU has Collins 32V1. NVB has Collins 30K. OMM has five-element beam on 28 Mc. and works Gatti Expedition regularly. LXQ has VFO on 3 to 4 Mc. BIY has rig on 3.9 Mc. WU finally hooked Montana for WAS. PLQ, EC for Watertown, held a meeting with KQ, LNX, OMD, MPP, PBM, QQB, and TF. The net is on 3725 kc. Tuesday nights at 8:30. QMJ has BC-454 ahead of S-20R. QJB reports a new net, the Eastern Shuttle, on 7120 kc., 8:30 P.M. Mon., Wed., and Fri. and 8:30 A.M. Sun. NCS is 3MWD. Others on are QIS, 2CRV, 2LWB, 2PUX, SLF, 3CUL, KQJ, 4HAV, and 8ZFW. KWD says he worked WAC on 28 Mc. in 1 hour, 40 minutes. FCZ has new NC-173 and 50-Mc. beam up to schedule his dad, BWJ. NBS reports the Dedham gang is interested in ¾-meter band. JNX is working on s.s.s.c. for lower frequency. W1USA had a set-up on the Boston Common for Army Day. New officers of the Plymouth Amateur Radio Club are: ZV, pres.; EIF, vice-pres.; QBA, secy.; BTL, treas. Meetings are held the 1st and 3rd Tues. of each month at 1 Leyden St., Plymouth. PSF is Asst. EC in Wakefield. MRK now has Class A. POL built an s.s.s.c. receiver. The South Shore Radio Club annual banquet will be held June 5th at Fore River Club in Quincy. LMG has charge of tickets. Traffic: (Feb.) W1KKJ 12, MDV 10. (Mar.) W1CCF 401, JCK 262, FGT 229, AQE 103, LM 79, NBS 51, TY 51, BB 34, DWO 34, PLQ 24, BIY 23, QMJ 22, BL 18, LXQ 17, ORT 16, PYM 16, QJB 15, QQD 15, UE 12, EMG 7, LMU 5, PZ 5, MDU 4, JDP 3, AYG 2, WU 1.

WESTERN MASSACHUSETTS — SCM, Prentiss M. Bailey, W1AZW — RM: BVR. SEC; UD. PAM: NY. BVR is using the new VFO. JAH used the camera more than the key this month. BDV has new FS135C installed in HQ-129X. LUA's change in working hours keeps him off the net. JE has the 7-Mc. swing shift net working in full swing on 7280 kc. at 12:30 P.M. each week day. OEE, of Westboro, will soon be on WMN. EOB lost all of his antennas during a recent wind. MUN sends in a nice OO report. RDD is new ham in Worcester. LSZ has a new beam rotator. QQO has increased power to 250 watts on 28-Mc. 'phone. IBZ is very active on 28-Mc. 'phone. RCC is a new ham in Leominster using a little 5-watter. Fitchburg Radio Club had a 28-Mc. emergency test with MBL, IBZ, EAX, RCC, OBU, FTV, and OOY taking part. A demonstration of emergency communications was given to the RC of Springfield. NLE, Springfield EC, arranged the affair. Those taking part were NLE, UD, KUE, MSN, OBQ, NH, CCH, NY, and IUB. UD is experimenting with underground antennas. RDR is new ham in Springfield. ESG has new McMurdo Silver transmitter. RDC is new ham in Holyoke. An 813 on 28- and 14-Mc. c.w. is the rig. COI rebuilt BC-457A and now drives 813s with it. Holly worked HH, FA, PA, G, and F on 3.5 Mc. QLT reports into WMN from Northfield. PQW is new Fitchburg outlet for WMN. IJT supports NY on WMN in the Springfield area and GBC reports from Worthington. The West. Mass. HF Net on 29 Mc. is really expanding with HAZ and QCA, of Pittsfield, and OBA, of Adams, reporting directly into Springfield. IZN is chairman of Pittsfield Radio Club Field Day activities. BJY is new member of PRC. JLT got Zone 23 by working C8YR. AZW was visited by MVF. Traffic: W1BVR 135, JE 132, NY 87, AZW 39, BDV 27, HNE 24, EOB 19, GVJ 18, LUA 16, K1NRU 13, W1MUN 7, JAH 6, HAZ 4, IBZ 3.

NEW HAMPSHIRE — SCM, Gilman K. Crowell, W1AOQ — On Field Day I shall be at 1OC/1 awaiting your messages. Those interested in club activities should contact any of the following: JIY, Berlin; APK, Concord; GDE, Manchester; EIO, Berwick; or HTO, Nashua. Congratulations go to LSN for organizing the 50-Mc. net on each Wednesday at 9 P.M. CRW can handle traffic into Vermont and has TL "C" and NTL appointments. The Swing Shift Net at 12:30 P.M. on 7280 kc. needs New Hampshire outlets. RBX is active on 28 Mc. BFT received WAVE certificate No. 12. OFR worked into Exeter on 50 Mc. with a portable 12-watt rig. PSX is sporting a new 400-watt rig with a beam to boot. The Berlin boys work Vermont and Maine nightly on 28 Mc. KYG eliminated his B.C.I. trouble by going to n.f.m. AWZ, OCV, and KYG represent the Manchester Radio Club's FR committee. QCY works into the NEN nightly. ANS and IDY are sporting new beams on 28 Mc. PVF now has his Class A ticket. QGL/1 is active on 28 Mc. from Littleton. Don't forget the Eleventh Annual Hamfest in Concord September 19th. Traffic: (Feb.) W1PVF 23, QYU 7. (Mar.) W1CRW 304, QYC 97, AOQ 60, IJB 36, MXP 22, PVF 18, QYU 17, GEY 16, QEU 16, ANS 6, PFU 5.

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC — JE, of Worcester, has started the Swing Shift Net, which meets on 7280 kc. at 12:30 P.M. week days. The object is to provide a traffic net for those who find it difficult, or impossible, to participate in the regular evening traffic nets. It has been running successfully for about three months, but at least one Rhode Island station is needed to handle traffic which the net receives destined for R. I. Might I suggest to any of you newer hams, or any of you old-timers who are holding back from getting into a traffic net because of doubts about your code speed, that you have a grand opportunity to get into either the regular evening Rhode Island Net, or the daytime Swing Shift Net, because both are *begging* for stations. You will build up speed if you join a net. The NAARO held an auction April 2nd attended by members of PRA, AQ, the Fall River gang, etc., and a good time was had by all. HXS is actually on 420 Mc. successfully. QWU is on 28.9 Mc. Your SEC says both the NAARO and PRA are coöperating fully on AEC but that the Newport gang is yet to be heard from. Traffic: W1QR 67, BTV 22, ODJ 12.

VERMONT — SCM, Gerald Benedict, W1NDL — RCO, Gerald W. Cunningham, jr., is a new ham in Barre. KRV, of Rochester, is new ORS. He reports to VTN, NEN, SSN, NTL, TL "C" and "G." MMU is rebuilding 28-Mc. beam. MMV has completed the rebuilding of his speech amplifier and is on 28 Mc. The Northern Region Hamfest will be held at the Heineberg Community Club, Burlington, July 3rd. It is sponsored by BARC. Traffic: W1KRV 155, PSD 81, NDL 8, MCQ 7.

NORTHWESTERN DIVISION

IDAHO — SCM, Alan K. Ross, W7IWU — Burley: FDH/LWR is completing new rig with pair of 4E27/8001s in final, all bands. LQN has a Sonar n.f.m. on 29 Mc. JPD is on 3.5 and 7 Mc. with a couple of Command sets. EZR is on with low power. DLA is busy fixing washing machines. New call is MCN with mobile rig in pick-up. Twin Falls: New club officers are: JMX, pres.; EYU, vice-pres.; LNC, secy.-treas.; and KRK, act. mgr. KEK built up combination grid dip meter, audio oscillator, etc. from *Handbook*. JMX is back on after a fire. New calls are MEJ and MFC. Boise: The club showed three movies at the last meeting. Several members promise to be out for Field Day. Let's hear from you if you are going to be out. My term as SCM is up June 15th. Thanks for your support and I will be happy to serve again if you so desire. Traffic: W7EMT 204, GTN 59, DMZ 40, IWU 14, GFW 5, JMX 3.

MONTANA — SCM, Albert Beck, W7EQM — SEC: EMF. CJN and KVU had successful QSO from Bozeman to Butte on 51 Mc. MDW is new call in Belgrade. EGN is using amplifier keying of VFO. FTO is working over a BC-929 into a 3" 'scope. CAL, HBM, and FTO have lazy man's Q5-ers from BC-453s. CAL has a 3.5-Mc. VFO from a BC-696. HBM has a 7-Mc. VFO. QB is getting a 5" 'scope to chase elusive wave patterns. Missoula and Hamilton are planning a new radio club. KDF has new QTH at Florence. LZU reports the Missoula gang is active on 28 Mc. KFW is again on 14-Mc. 'phone. FIN is back on the air after a period of rebuilding. GFV and KVU are king of DXers in Billings and Bozeman, respectively. KGF holds weekly schedules with his brother, 9BCC, in Wisconsin. FMV is using vacuum tube keying. COH has his 4E27 under control now and worked VK3FC on 7 Mc. FGB reports hamfest preparations under way at Livingston. KJX is busy with traffic. FGB can relay traffic through various nets anywhere. DPR is busy organizing CAP emergency nets. LOB and BHP completed 28-Mc. mobile units. LVY is teaching ham radio to local blind man. The Butte club is getting club paper out. Traffic: W7EGN 26, FGB 18, COH 4.

OREGON — SCM, Raleigh A. Munkres, W7HAZ — SEC: HLF. RM: APF. A decided increase is noted in v.h.f. activities throughout the State. Astoria: Weekly schedules between Tillamook and Astoria are continuing. FKA, in Tillamook, with 27 watts is solid into Astoria. KQN rebuilt his mobile job. Thirteen of the Astoria gang attended the Vancouver hamfest. Pendleton: The Pendleton Club extends a cordial invitation to anyone to attend one of its meetings. Pendleton is active in AEC work and is receiving wonderful coöperation from the City Government. ADX is active again. BDN, club prexy, is very active. BEE is trying to get a 50-Mc. transceiver to receive. MQ sends in a fine report on AEC activities. Klamath Falls: GLF is now ORS. New calls: LZD, MAN, MCN. Activity is picking up on 3.85-Mc. 'phone in this area. New club officers: GLF, pres.; LHG, vice-pres.; HVD, secy.-treas. Oregon Vocational School now has over 400 students. GPZ is in charge of radio department. HOZ teaches code and IPI radio service. OVS has three transmitters with a number of beam antennas on the way. LaGrande: The Blue Mountain Radio Club was formed in March with KVG, pres.; JOD, vice-pres.; CHN, secy.-treas.; HBO, admin. asst. Meetings are held in the radio lab of Eastern Oregon College. Baker: GVX and HAZ are getting the 144-Mc. gear lined out. HAZ has been trying to get a 28-Mc. mobile job in operation. LQW has been putting up a mast for a beam. Traffic: W7APF 342, LT 34, JMZ 26, GLF 15, FNZ 6.

WASHINGTON — SCM, Clifford Cavanaugh, W7ACF — GP our SEC, is hard at work getting the AEC program going here in the State. The BCLs still keep DGN on the move — they will get him yet. JFB is converting a 625A for 144 Mc. CZY writes that he may get out of the hospital this summer. FB, Larry. AXT is new OPS and wants traffic

(Continued on page 88)

schedules for Bremerton. CKT still leads the State in traffic handled. He also states that WARTS Net now has 68 stations with outlets to Trunk Line "I," Trunk Line "L," Mission Trail, American Legion, WSNET, Pioneer, and FARM Nets. FB, gang. BTV is busy on 28-Mc. 'phone handling traffic to and from Japan. FWD is busy working over his BC-610 when not pounding brass on WSNET. RAO has new jr. operator — a YL. Congrats, Chas. HGC is off the air because his shack is being used as a bedroom for company. FIX is busy printing his very FB bulletin for WSNET members. Since the first issue of this paper the procedure on the net has greatly improved. FRU reports TLA going in fair shape. ZI is having VFO troubles — he may even have to buy one. ZU wants traffic outlet in Pullman. Whatever happened to ITR over there? BAQ is going great guns with new Sonar VFO. CWN says he received a QSL card from the QSL Bureau recently from a ham who he had worked in 1937. (No doubt this card was hanging on Frank Pratt's wall all during war — he likes nice cards, too.) JC still works more DX on 3.5-Mc. c.w. than anyone else up this way. BG is working local 28-Mc. 'phone around Tacoma. BL reports three new countries worked and promises a kw. on the air soon. EYS says his antenna blew down the first week of the DX Contest. It never fails, OM. APS is having a tough time keeping schedules. The gang on WSNET is taking turns at being NCS and having a lot of fun out of it. ETO is busy recruiting stations for WSNET. DG is mixing brass pounding and paper hanging. LEC and KHL say that their club at Puyallup has been unsuccessful so far in getting the Puyallup Fair to allow them space for a radio shack on the grounds. Don't give up, fellows. We need that traffic: W7CKT 1049, FRU 346, FIX 175, ACF 109, FWD 34, ZU 30, GP 28, HGC 22, BTV 17, ETO 17, JWD 17, BL 16, JFB 13, CWN 1.

PACIFIC DIVISION

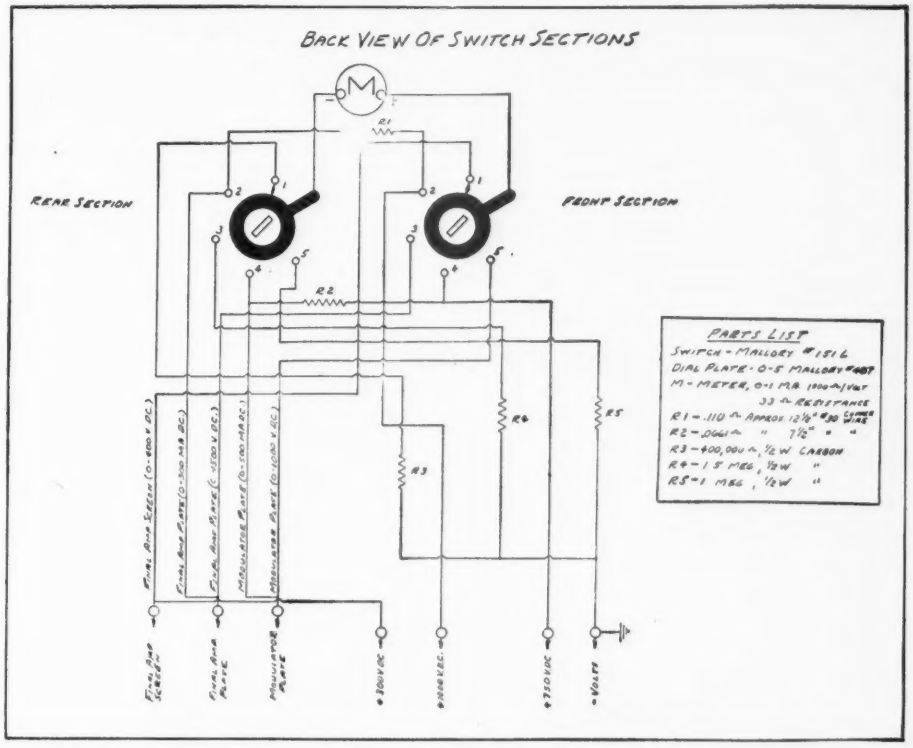
NEVADA — SCM, N. Arthur Sowle, W7CX — Asst. SCM, Carroll Short, jr., 7BVZ. SEC: JU. ECs: OPP, BED, TJY, QYK, JLV, JVW. RM: PST. PAM: KHU. TJY has a BC-654 set for emergency and Field Day work. TJY operates YN, Nevada Amateur Radio Club station. FRE is on 3.5 Mc. with VFO. KOI has his tank rig operating on a.c. using a flock of selenium cells in a quadrupler circuit. KOA has 80 watts on 14-, 7-, and 3.5-Mc. c.w. QYK, on 3.5-Mc. c.w., is control station for the Elko County Emergency Net. NCR has a folded rotary 35 ft. up for 28 Mc. TFF is active on 28 Mc. LUV is on 28,885 kc. KIO is on 28 Mc. with 75 watts to an 815 and three-element beam. SXD and NCR are activities managers of the Southern Nevada Amateur Radio Club; TFF is vice-president. The club meets 1st and 3rd Thursday. LPO has 20 watts on 7 Mc. NIV has 75 watts on 7 Mc. LFC is on 14, 7, and 3.5 Mc. and LSD is on 28 Mc. Anyone needing Nevada can find WVZ on 14,013, 14,032, 14,050, and 14,088 kc. 4 to 8 P.M. Traffic: W7BED 427, TJY 59, FRE 20, JU 13, BVZ 4.

SANTA CLARA VALLEY — SCM, Roy E. Pinkham, W6BPT — Asst. SCM, Geoffrey Almy, 6TBK. RM: CIS. PAM: QLP. EC: CFK, TFZ, JSB. WNI has been forced to drop from the Pioneer Net because of increased activity as instructor for PAA. KZJ is on from South San Francisco. CAZ is on 28-Mc. 'phone from Mt. View. The Monterey Bay Radio Club is working on an emergency net to operate on 28 Mc. PBV writes from Africa, where he is with the Hallicrafters-Gatti Expedition. The expedition will operate VQ5 from Uganda. YPM has returned to this section from Los Angeles. BPV reports working JPU in Fresno from San Carlos on 144 Mc. Both stations were using sixteen-element beams. The contact was made at 7:15 A.M. HC is keeping schedule with MUR/3, who is back in Washington, D.C., and keeps in touch with his family in San Jose via HC. ZZ has installed lazy man's Q5-er and reports reception very much improved at his QTH. Miles now has real single signal reception. YHK is on in Hollister running 600 watts to a pair of 813s. He operates on 3.5- and 7-Mc. c.w. TFZ reports the emergency net for San Mateo coming along very well with about 15 portable-mobile rigs on 144 Mc. The sets are all built at the club meetings held in the San Mateo Junior College shop. VIQ and VHE were guests at WCL's shack celebrating his and Doc's second wedding anniversary. BWB has returned to Portland, Ore. Traffic: W6WJM 402, NNX 105, WNI 66, HC 24, VZE 12, ZZ 6, DZE 3, TBK 2, SYW 2, YHK 2.

EAST BAY — SCM, Horace R. Greer, W6TI — Asst. SCM, C. P. Henry, 6EJA. SEC: OBJ. ECs: AKB, EHS, NNS, IT, IDY, QDE, ZB, WGN. On April 2nd at 7:30 P.M., 3804 kc., the Mission Trail Net started a c.w. net with VDR as Net Control. This net is open to straight key operators only. FDR has 1 kw. on the air and is QRL with Pioneer Net and Oklahoma Net nightly. Bill is trying to get a local 3.5-Mc. c.w. net going. If interested contact Bill at 1801 109th Ave., Oakland. QXN is getting everything under control in new QTH. EJA reports the Richmond gang is holding emergency tests at regular intervals. WVT, ex-8KIS, is a new-comer to East Bay. The gang is sorry to see RVU leave this area for points East. It's a girl at YHI's. The NBARA puts out an interesting newspaper each month and according to all the dope, this club is doing FB. At its regular meeting

(*Continued on page 90*)

MALLORY HAM BULLETIN



An Interesting New Application for the Mallory 151-L Hamswitch*

This switch may be used conveniently for switching a single meter into or out of 5 isolated circuits. Ample space is provided between its two switch sections for soldering meter multiplying resistors directly to its soldering lugs. Thus, range expansion of the meter may be had automatically as the switch is actuated from circuit to circuit.

Use this switch with voltages up to and including 1500 volts DC. Because its simple construction omits the two circuit-closing center sections, it must be used with multiplying resistors exclusively when measuring the flow of DC. The multiplying circuits must remain active in each respective circuit at all times.

Switch No. 151-L comes complete with pointer knob, hex nut and lock washer. Dial Plate No. 487 has been designed especially for use with it.

You can rely on Mallory Precision manufacturing to supply you with the most dependable line of: ham band switches, push button switches, controls—rheostats—potentiometers—pads, tubular capacitors, transmitting capacitors, dry electrolytics, dry disc rectifiers, vibrators, and vibrator power supplies—practically every component you need to keep your rig in A-1 condition.

Send for complete details on this switch. A copy of the above schematic will be sent upon your request.

*Reg. U. S. Pat. Off.

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MALLORY

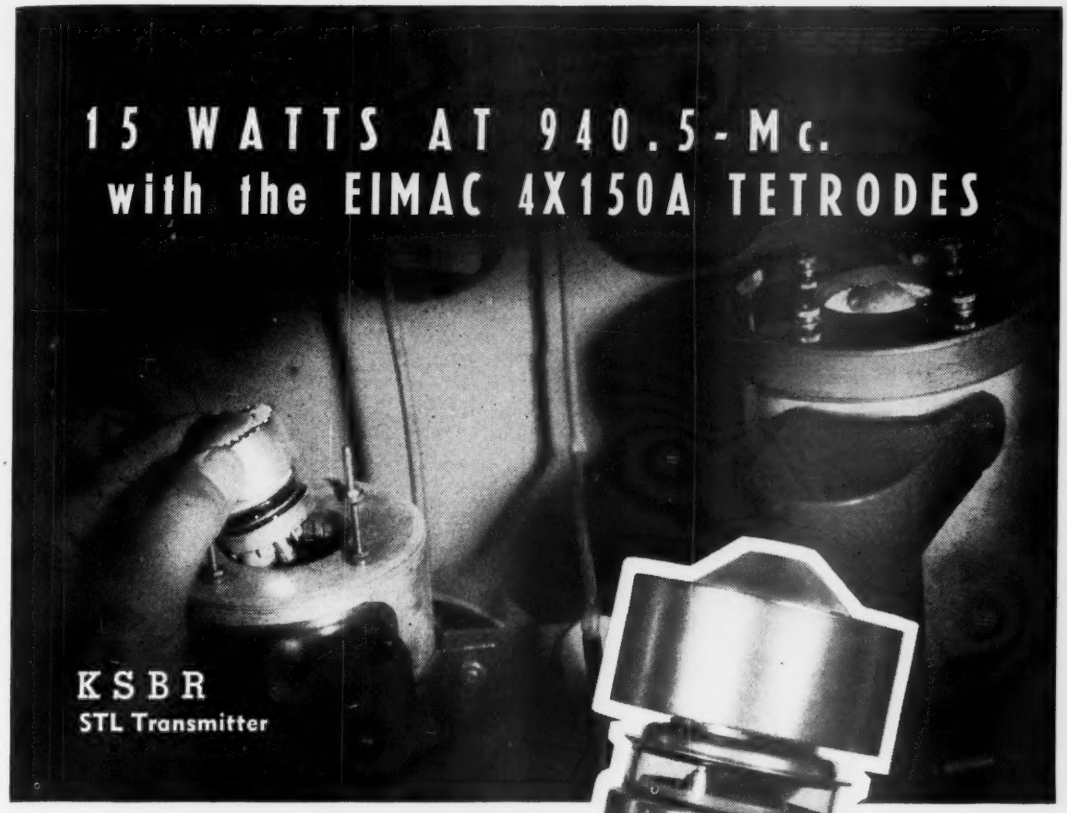
on Apr. 8th the Northern California DX Club presented two 18" engraved gold trophies to the club winners in the recent ARRL DX Contest. One for c.w. went to RM and one for 'phone to TT. The 140,415 points made on c.w. by RM was the highest score ever to be turned in, in this neck of the woods. Elvin, with 71,010 points on 'phone, leads the field. ZB is new EC for the San Leandro area. FXX is QRL with special correspondence with Maui. IKQ is planning to visit Italy for three months this summer. PB is rebuilding. NZ is working FB DX for a change with new beam. MEK claims there is nothing like a good rotary. ELW, new chief operator of the Oakland Radio Club, reports that the new club 1-kw. transmitter will be installed shortly and will be operated on all c.w. and 'phone bands. EY has been QRL teaching railroad freight dope three nights a week and we understand Mac makes a good prof. BIL is chasing DX. NO is worrying about a new receiver. AED finds out that working contests is hard work after all. BUY is about set to return to the air from new QTH. The SARO is all set for Field Day and the gang hopes to be a winner this time. The club took second place last year in the one-group rating. UPV is rebuilding. DUB has new final p.p. 4250s. ZUI is knocking off DX. The El Cerrito Radio Club is going strong. The Hayward Radio Club bought a portable building for club rooms. The Mt. Diable Radio Club invites visitors. It is necessary that all ORS and OPS report each month. Traffic: W6FDR 507, QXN 351, VDR 60, YDI 47, ZM 14, TI 8, EJA 1.

SAN FRANCISCO — SCM, Samuel C. Van Liew, W6NL — Phone JU 7-6457. ZKS is busy building a 300-watt 'phone and c.w. rig using an 813 final. PKI is warming up his 144-Mc. mobile equipment for spring activity. ADQ is on 7-Mc. c.w. and is handling some traffic. WHL also is after 7-Mc. traffic. OFB (prewar) now is 9TGT of Gary, Ind. He will be glad to contact some of his many California friends. MHF is having power-leak QRN, so no DX. ZEI is constructing a new Superhet. YZP is off the air at present having sold his transmitter. He is busy attempting to iron out a few of the bugs in a 50-Mc. converter he is building. YQI, who was quite active on 28-Mc. 'phone here, is now residing in Maryland. His new call is 3NVC and he is looking for any of his old buddies on 14-Mc. c.w. now. Ex-HJP writes that a new transmitter using a pair of Eimac 450TH tubes is being constructed at the University of Minnesota. At present they are using an 814 transmitter at ØDSF. Prevailing conditions call for strengthening of the Emergency Corps and in line with the present conditions we have added two Assistant Emergency Coördinators to our present staff: JWF, Frank E. Johnson, 1403½ San Bruno Ave., San Francisco, who will assist in the low frequency equipment; and BYS, William Green, 2800 Balboa Street, San Francisco, who will assist in the high frequency mobile equipment. We sincerely urge every one having available emergency equipment to volunteer for this work. Get in touch with your local Coördinator. Many of the clubs throughout the section are planning and preparing for the coming Field Day Contest. Among them are the San Francisco Club, the San Francisco Naval Shipyard Radio Club, and the Marin Radio Club. The March meeting of the San Francisco Radio Club was held on the 26th. The speaker of the evening was JDV, whose talk was on "Notes on Transmitter Design." Many good ideas were brought forth on controls, signal shifting, band passes, and measurements. The usual raffle followed. The S. F. Naval Shipyard Radio Club held its annual election of officers. They are as follows: Pete Dardarni, pres.; Frank Johnson, vice-pres.; Fred Neubauner, treas.; Jim McGorry, secy. The club now has transmitter-receiver equipment installed at the club rooms. Thanks for the reports, gang. Traffic: W6JWF 104, MHF 90, ADQ 50, NI 20.

SACRAMENTO VALLEY — SCM, John R. Kinney, W6MGC — Asst. SCM, R. G. Martin, 6ZF. SEC: KME. RM: REB. OOs: ZF, OJW, AK, and ZQD. OES PIV. OJW is building a 1000–100–10-kc. Standard and soon will be a Class I OO. OJW has worked all 58 counties in SARC California County Contest. WTL is WAC on 28 Mc. and recently worked HL1MH, MI3ZJ, PY2CK, G6AY, VK3YS, and XE1HG. AK, Walnut Grove OO, is mobile on 28 Mc. AYZ is picking off best DX on 14 Mc. RMT is using YTN's rig while Tim is in college. WTL is doing well on ground wave on local work on 28 Mc. with 120 watts. PIV has done successful handie-talkie experiments on conversion of SCR-536D on 144 Mc. He reports that 6AAX/7, in Reno, Nev., is converting two APS-13s for 420 Mc. and that OY is conducting successful experiments with triode converters and grounded grid r.f. using 6J6s on 144 Mc. At the latest SARC meeting CMJ gave a very interesting talk on commercial broadcasting f.m., a.m., and television. ZYV won a Turner crystal mike in prize drawing. Lately the local emergency net control has been checking in to KME flying at about 7500 feet altitude and operating on 144 Mc. GHP is Coördinator for Roseville and LYQ is Coördinator for the Corning area. MGC is rebuilding a BC-459A to drive an 813 for 7- and 14-Mc. c.w. operation. DBP has new HRO and new Collins exciter to drive new p.p. 8001 rig. MGC appreciates the excellent support given him during his term as SCM and wishes to thank everyone. Traffic: W6PIV 57, OJW 5, WTL 2.

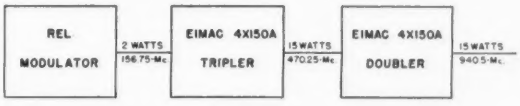
(Continued on page 92)

15 WATTS AT 940.5-Mc. with the EIMAC 4X150A TETRODES



FREQUENCY UP 6X, (156.75-Mc. to 940.5-Mc.)
POWER UP 7X (2 watts to 15 watts)

Here's a STL transmitter that's in operation on the new 950-Mc. band, fulfilling all the FCC requirements and powered by Eimac 4X150A tetrodes. It's a part of the studio-transmitter-link between the San Bruno studios and the 250 Kw FM transmitter of station KSBR high atop 3849-foot Mt. Diablo some 33 miles away.



The R-F amplifier was specifically designed for the KSBR application by Eimac engineers. It is driven by an REL modulator delivering 2 watts output at 156.7-Mc. to one Eimac 4X150A in a tripler stage, which in turn drives a single 4X150A in a doubler stage, providing 15 watts useful output at 940.5-Mc.

The Eimac 4X150A is ideally suited for this application because of its high power gain at relatively low plate voltages, ability as a frequency multiplier without loss of amplification, low grid drive requirements, and a high ratio of transconductance to capacitance. It also has the advantage of being physically small and functionally designed for simple installation.

Complete data on the Eimac 4X150A for STL and other UHF applications is available by writing direct.

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Eimac 4X150A

ESSENTIAL DATA
KSBR STL TRANSMITTER

REL MODULATOR, MODEL 694
EIMAC 4X150A, R-F AMPLIFIER

Useful Output Power	15 watts
Frequency	940.5 Mc.
Frequency Stability	.002%
Audio Frequency Response.	
Substantially flat	50 to 15,000 cycles
Distortion	.5% Max.
Noise Level	70 db below 100% modulation
	± 100 Kc. deviation

Eimac 4X150A
General Characteristics

Heater voltage	6.0 volts
Heater current	2.8 amps.
Minimum heating time	30 secs.
Grid Screen amplification factor	4.5
Direct interelectrode capacitance (Average)	
Grid-Plate	0.02 μμf
Input	14.1 μμf
Output	4.7 μμf

Maximum Ratings

D-C Plate voltage	1000 volts
D-C Plate current	250 ma.
Plate dissipation	150 watts
D-C Screen voltage	300 volts

Follow the Leaders to
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TUBES
The Power for R-F

ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Wortman, W4CYB — The Key & Mike gang has purchased a 2.5-kw. generator for emergency power supply. KJS has been appointed EC. BYA has started a new code class. HUL sticks to 3.85-Mc. 'phone. IFS and IDO are active on 28 Mc., along with MRH, who slides up to 14 Mc. occasionally. IDO has a 144-Mc. rig on the way. SKY works 3.85 Mc. MYO can be found on 7 Mc. with eyes toward n.f.m. on 28 Mc. LAH is close to obtaining DXCC Certificate while DCW lingers somewhat behind. 2MGA/4 is working n.f.m. on 28 Mc. NI hooked first VK. DGV is sticking to 28 and 14 Mc. HUL now is OBS. The Charlotte gang has purchased an HT-9 for the shack, and plans power supply for emergency use together with a fixed-up shack. Club call is BX. AHF is burning up 14-Mc. 'phone. ISH, who is over in Australia, reports AHF as the loudest thing he can hear. LZF ran up a nice score in the DX Contest. ZG has a new rig on the air working FB. OG blew a pair of 250THs substituting a pair of 810s. Plans are underway for the organization of a slow (10 w.p.m.) c.w. net on 7210 kc. for operation this summer. Instigators are DIS and JPY. A 3.85-Mc. 'phone net has been organized within the State known generally as the Tar Heel Net. It operates nightly on 3865 kc. with CVQ as Acting NCS. All 'phone men are invited to participate. A regional net will be formed in this area for emergency work. Traffic: W4CFL 346, IMH 211, KJS 119, EZN 72, CVQ 63, FXU 55, CYB 27.

SOUTH CAROLINA — SCM, Ted Ferguson, W4BQE/ANG — DAW works 3.5-, 7-, and 14-Mc. c.w. CZA has a new three-element beam and is working on 3.5, 7, and 28 Mc. DNR can be heard on 7- and 14-Mc. c.w. BIZ is building a bandswitch rig for 3.5, 7, and 14 Mc. DBK works 28-Mc. 'phone. GCH is completely rebuilding his rig. BWV works 28-Mc. 'phone. HJR says he is working 3.5- and 7-Mc. c.w. and wants traffic. IZD is building a 3.5-Mc. VFO. HTR is to be heard on 28-Mc. 'phone and 3.5- and 7-Mc. c.w. FCK hopes to have his pair of 813s on soon. DFC works 14-Mc. c.w. and 28-Mc. 'phone with some DX on 14-Mc. c.w. LMB is trying to start a 28-Mc. ground-wave net in South Carolina. MRJ has his new final on the go. CE works 3.5- and 7-Mc. c.w. and 3.85- and 28-Mc. 'phone. MAR has his 813 going with 200 watts. ANK is pushing the 3.5-Mc. C.W. Net. If you work c.w., join him fellows at 9:00 P.M. week days on 3735 kc. MYM is new ham in Rock Hill. We also welcome to this section NKA, HXZ, and NLX and would be glad to have you fellows take part in the section activity. Your attention is called to the Field Day coming up in June and we hope that all clubs will take part in the event. Traffic: W4ANK 51.

VIRGINIA — SCM, Walter R. Bullington, W4JHK — KYD is taking Naval Reserve cruise to KV4 Land. IPS has replaced his BC-696 with an ART-13. He also has a 522 and eight-element beam on 144 Mc. IWA has p.p. 813s on 28-Mc. 'phone n.f.m. CLD is active on 3.85 and 144 Mc. and MZR has 30 watts to an 807 on 28-Mc. 'phone and is getting good DX. JHK has been on 28 Mc. with 45 watts to push-push 6L6s. He has new frequency multiplier and expects to be on all bands soon. Not much news was turned in this month except traffic reports. Remember, gang, the present SCM term is up June 14th so get your nominations for the man you want in office in to Headquarters by June 1st. Traffic: W4IA 107, NFQ 25, KYD 22, IPC 21, KVM 17, CLD 15, KJT 2.

WEST VIRGINIA — SCM, Donald B. Morris, W8JM — QG a doctor, active on 28-Mc. 'phone, had a patient seriously ill. Twenty minutes after arriving home a radiogram was in Tokyo being delivered to the patient's son and five hours later the son was on his way home by air. LCN now is 4NKQ, Elsmere, Ky. NTV, AHU, RGP, KXV, and MIS have 28-Mc. round table each week. EHA's four-element beam blew down during storm and work is now in progress on new five-element rotary. FEO, EP, JKN, EHA, and SPY are active on 144 and 50 Mc. BWT is new amateur in Parkersburg. MARA will use its new club call, BIA, on Field Day location with gasoline generator for power. YGL has new v.h.f. location and is active on 28 and 144 Mc. KWI, VAB, QG, and ESQ have 28-Mc. rigs in their cars. GBF has new frequency measuring equipment with improved oven control. BTV, AUJ, and DFC have increased their traffic by 3770 West Va. Net operation. JM has new 28-Mc. beam and handled traffic from GIs in Europe and Africa. LII boosted traffic totals by 3.5 Mc. trunk line work. West Va. amateurs may be found around 3770-kc. c.w. and 3911-kc. 'phone. Traffic: W8GBF 177, BTV 109, OXO 98, LII 71, JM 62, DFC 18, AUJ 10, QG 8, PQQ 5, YGL 3, EP 2.

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, Glen Bond, WØQYT — Here is some news from Pueblo way: FDD is with radio station KDZA, but as hotel rooms are no place for ham gear he is not on the air as yet. The Pueblo boys are working on 144 Mc. using SCR-522s and grounded grid superregenerative receivers. The Colorado Springs emergency net is holding regular drills and is growing in members. The gang is plan-

(Continued on page 94)

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ning Field Day activity again this year. The Denver Radio Club is making plans for a big Field Day and has hopes of running up a heavy score. The committee in charge is working hard to make it a success. DRB was back in Canon City for a day recently. Clay hopes to be on 3.85 Mc. at Olathe, Kansas, soon. He is working on maintenance of GCA equipment for the Navy. WYX is busy installing equipment for the Courtesy Patrol in towns over the State and has not much time for ham radio. ZSQ has a new three-element beam for 28 Mc. JBI has a beam-building project cooking. Three Colorado amateurs attended a communications conference in Oklahoma City put on by the Civil Air Patrol. Everything was fine until a tornado disabled their airplane, but another ship was sent for them and they were only a few hours late getting home. Traffic: WØQHI 23, MOM 16, LZY 13.

UTAH-WYOMING — SCM, Alvin M. Phillips, W7NPU — The FARM Net is doing a swell job of covering the intermountain area — Utah, Wyoming, Idaho, Nevada, Montana, New Mexico, and Colorado. Net time is 7:30 P.M. MST Monday through Friday. The net also handles personal contacts to all parts of the world. UTM has completed a 50-watt e.c.o./exciter which doubles as an emergency rig using a PE-103A power unit. KIY is rag-chewing and working traffic on 3.5 Mc. with the Colorado and Wyoming nets. TST has moved in his new home and is anxious to get back on the air. DLR has revamped his final to a balanced tank and is driving the 813 with a 274N. OKF is banging away on 3.5-Mc. c.w. with a pair of 812s. JHH is enjoying his new home and ham radio. Traffic: W7UTM 98, RPX 59, DLR 19, KIY 19, TST 7.

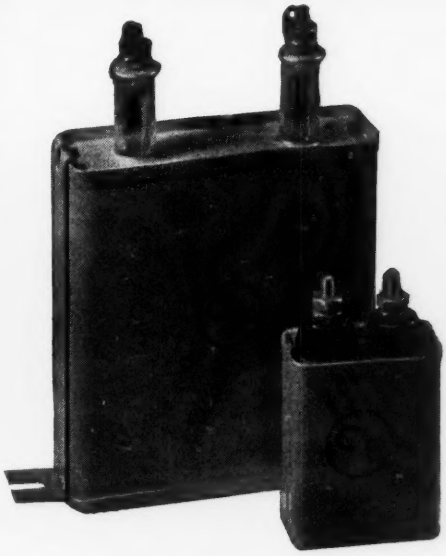
SOUTHEASTERN DIVISION

ALABAMA — SCM, Dr. Arthur W. Woods, W4GJW — SEC: KCQ. PAM: BA. Thanks for the FB reports received from many parts of the section this month. DXB works portable from WGHH, and recently became a member of the Naval Reserve Net. CIU is Class A. BWG is on 3.85-Mc. 'phone. GOF sold out after marriage, and is cautiously reinstating amateur radio now. LRU works on 7 Mc. ADJ and HAN work 28 and 7 Mc. respectively. Where is the Gorgas bunch? MXU works 7 and 14 Mc. from new QTH, concentrating mainly on traffic. He solicits inquiries for an Alabama 7-Mc. net for daytime. DTV has been instrumental in setting up traffic nets at Mobile on 28, 7, and 3.85 Mc. INU is NCS of 144-Mc. net on 144.7 Mc. at 2000 CST Wednesdays. The 28-Mc. net meets Sundays at 2100 on 29.2 Mc. The 7-Mc. net meets Thursdays at 1930 on 7025 kc. with DTV as NCS. The 3.85-Mc. net meets Sundays at 0900 on 3955 with IBZ as NCS. The XYLs of various mobile hams meet Friday nights at 2000 on 29.2 Mc. with the YF of DTV acting as NCS. The last session exceeded 2½ hours. Are there any hams in north or south Alabama who would care to report station activities?

EASTERN FLORIDA — SCM, John W. Hollister, W4FWZ — Emergency Corps: ALP, Tampa, has program worked out with Red Cross and other agencies plus well-planned AEC set-up. IQV, Lake City, has program with Red Cross, FPL Co., Federal, and State Forestry, State Police Radio. The State manual is based fundamentally on Chap. 22, 25th edition ARRL *Handbook*. Check your emergency gear. Is everything which might be required on hand? Cortez: DQW requests that every station located where there is no EC write him and volunteer for the assignment. Jax: DU is now knocking 'em off with BC-610. NKC, on 28 Mc., is laying out lines for rotary. AWE reports no B.C.I. with n.f.m. on 28 Mc. Lake City: HLC is on 28-Mc. n.f.m. with 8005s. Now that CPG has moved there IQV can set up 144-Mc. circuit. St. John Club members are NN. AGB, HLC, and IQV, with CPG looking in. Miami: BT schedules OBS now at 11 P.M. ES reports USCGA 7CGD includes Puerto Rico, Caribbean and Canal Zone. BYF sent an untold number of OO cards during the DX Contest. BT made WAC! JAV is KP4 now. NLS is on 28 Mc. with 813. Down came the beams of IKI and VV during squall. KXO and JAV made RCC. Sixteen-year-old NCP is on 28 Mc. with nice beam. IYT, new ORS, has 813s on 28, 14, and 7 Mc., and reports 99 countries with vertical 7 Mc. and full-wave 14 Mc. West Palm Beach: FNR reports 50-Mc. gang lined up for state QSOs. 144-Mc. net members: DUW, FLH, FVW, HBF, IPW, JIP, KKU, KMM, LIP, LUS, MNL, VV, BRB, DCF, FNR, ISR, IUJ, ALP, AQ, AYP, DDM, DES, FPC, FYI, GEE, HAD, HNT, KKY, KM, LAW, MTI, RQ, KQR, LPC, LSK, CFO, EID, EKU, IPL, JMU, RU, GIJ, GIY, GJO, MJP, QN, IQV, CPG, DQW, IMF, NEE, MKI, AYX, CCC, GFE, GMJ, MGA, Traffic: W4IQV 257, AYV 194, ES 110, AAR 97, IKI 51, DQW 44, MWT 29, BYF 28, MKP 26, BT 25, FWZ 25, MNT 25, DEP 22, ERU 19, KMV 12, LJM 10, MVJ 9, PEI 7, AFF 5.

CANAL ZONE (Special report) — KZ5AW reports FS monitoring 3.5 Mc. to find a spot for 3.5-Mc. net to tie into Florida Palmetto Net. There was a lot of activity in the DX Contest and one score over 100,000. There are 75 stations in Canal Zone now. FS is RM for Pacific side and AX for Atlantic. Locally, the traffic net will pass information around the Isthmus. Traffic outlets through Florida and other spots are needed. The CZARA, under GD as prexy, threw a hamfest that will set the pace in the future. Best QSL was shown

(Continued on page 96)



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		Paper Capacitors	Plasticons	Paper Capacitors	Plasticons
10	1000	1.95 lbs.	1.7 lbs.	31 cu. in.	30 cu. in.
4	2000	2.0	1.23	31	23
2	3000	2.0	1.21	31	19
1	4000	1.77	.94	28	19
2	5000	5.2	2.9	70	60

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by JB. The big prize, a VHF-152, was won by LN. MX is ex-W4IP (former SCM of E. Fla.). Ham exams are given on the second Friday of each month at Corozal.

WESTERN FLORIDA — SCM, Luther M. Holt, W4DAO — ADW is a new-comer to our section; he teaches school at DeFuniak Springs. Welcome, OM! ECT/FJR have an FB electronic keyer. NJB bought a new receiver. NML is newest call at Pensacola. ACB, our SEC, wants information as to who in the section is Class A. If you are Class A please drop him a line. LT promises a visit to Pensacola gang soon. KYJ worked Pensacola on short skip. QU built 28-Mc. rig. QK bought surplus VFO. JPA operates mobile exclusively. HIZ wants 3.5-Mc. antenna. MZJ has ART-13. MEN is planning more power. LCY plans activity soon. JV runs kw. on all bands. EQR erected towers for long wire. We wonder if it spells 7-Mc. work for him. DXQ made WAC on 7 Mc. MUX plans on changing QTH. FDL moved to Evergreen. MOB is rebuilding. NFN works DX. NFM had trouble with final amplifier. DZX went n.f.m. Traffic: W4AXP 47.

GEORGIA — SCM, Clay Griffin, W4DXI — Don't forget to mail your activity reports so I will receive them no later than the fifth of each month. LNG sent a fine report on v.h.f. activity. He reports LNF and KHL hold Georgia 144-Mc. record with 100-mile contact. LNG operates on 14, 28, 50, 144, and 236 Mc. with p.p. 24Gs. He has sixteen-element beam on 236 Mc. BOL acquired a BC-639 receiver for 144-Mc. work. LJB has a BC-325 transmitter in operation. JDR plans to put up a three-element 14-Mc. beam. BOL and DXI chased DX on 3.85 and 3.5 Mc. during the winter and spring, with fair success. BOL's best was ZL on 3.85 Mc. DXI needs Asia for WAC on 3.5 Mc. The Fulton DeKalb Net has about 35 members with LNG as NCS. BIW has portable-mobile equipment for operation from 3.5 to 28 Mc. The Cracker Net still needs a reliable outlet in Savannah. We would like to hear from stations interested in ARRL appointments. Traffic: (Feb.) W4BVK 374, KV 118. (Mar.) W4BVK 87, DXI 9.

WEST INDIES — SCM, Everett Mayer, KP4KD — The KP4 gang was saddened by the sudden passing of KP4DY, ex-K4FAB, on Mar. 16th. AM worked all 10 U.S. districts on 27- and 28-Mc. 'phone on Mar. 25th. He worked PAØ for a new country and schedules KP4CE/W8. BE worked G3 and has nice rag-chews with WØFFB and W3KBE. The Radio Flotilla of the U.S.C.G. Auxiliary sponsored a broadcast Mar. 18th on which the SCM represented ARRL. AQ was the spark plug. The PRARC sponsored a broadcast on WKAQ. Jenny Ramirez, ex-K4FOW and XYL of KP4DY, gave a 15-minute talk on the club aims and activities. The PRARC is running code classes for beginners at Central High School on Tuesdays and Thursdays. FD returned to P.R. from Atlanta. FP bought HT-9 from AU, who plans a kw. on 28-Mc. 'phone. CN moved to new QTH. FU and DT made debut on 28-Mc. 'phone. ES was granted an OBS appointment. Watch the *Ground Wave* for schedules.

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, Vincent J. Haggerty, W6IOX — Asst. SCMs, W. J. Schuch, 6CMN, and Irvin O. Hege, 6FYW. Los Angeles YLRC news: G2YO was guest at March meeting held at home of QOG. Fourteen YL/XYL operators were present. CBA and CEE are new YL and XYL operators, respectively. UXF worked Tanganyika on 28-Mc. c.w. YRL has 60-ft. steel tower for 28 Mc. NAZ is on 3.85-Mc. 'phone and 7, 14, and 28 Mc. UHA has confirmation on LA8 and VP2 DX; she runs weekly schedule with KA1CB. QOJ has 101 countries on 14- and 28-Mc. 'phone. TSL ran 'phone schedule with KG6CN. WSV's DX is Alameda; she also sent in this report. AOM, BXZ, ZCE, PAP, and WUY form the "Pacoima Hair Net" which meets Wednesdays at 8 P.M. on 29.4 Mc. Pasadena Short Wave Club news: Club meets second and fourth Fridays at 736 Rosemead Blvd. Technical talks, "Board of Experts" quiz program, used parts auction, and movies are some of the club's activities. AEE is on Mission Trail Net; he is fixing s.s.s.c. exciter for 3.85 and 28 Mc. PFO is building kw. rig with 59¢ 304TL as nucleus. ON has yen for rotary beams and is on 50 and 144 Mc. FPV is converting BC-459 and BC-696. WSW and WWM are antenna experimenters. NV has bugs on 144 Mc. BUK put rig in cabinet. GTE is building 100-kc. standard. TUK has new sixteen-element beam on 420 Mc. KA is stuck with 3.85-Mc. 'phone. MQP is building sixteen-element beam for 144 Mc. A folded dipole on 14 Mc. and 500 watts from a pair of 813s netted BGV 7 countries in 2 hours. MU brought his OBS, OES, and OPS certificates, took a squint at the SCM, and said he is fixing a four-element beam for 28 Mc. RXT made the BPL on deliveries. CMN tops the section in traffic and got 7LPA, Arizona, into SCN. AAE works 3.5 and 7 Mc. AKS is active on SCN. QIW is Ventura SCN member. VAQ had fun in DX Tests. 7MSG/6 now is 6MSG. Vertical antenna increases night 28-Mc. contacts for YCZ. CNY is San Luis Obispo Club call. MFK is busy with OES work at Lancaster. KEI has kw. rig under construction and reports emergency drills for San Fernando Valley. AM has eleven directions available on rhombics for DX work. MEP is on 3.85- and 28-Mc. 'phone JUJ is on

(Continued on page 98)

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GENERAL ELECTRIC

407-151E

3.5, 7, and 14 Mc. UFH moved to W2 Land. ASW is rebuilding. L.A. Metropolitan Radio Club has passed the 200 mark in membership. The club meets at Embassy Auditorium on first and third Mondays. FKZ is pres.; GTE, secy. MBA and MBD had 3-way 28-Mc. contact with Chile in which MBA's 30-watt mobile rig outdid Helene's half-kw. MBD has worked 100 countries on 'phone. LS and SPQ formed radio business partnership. SA has rhombics for DX. DA has new 9NLP rotary. AOA cools his bug via 28-Mc 'phone diversion. EAY is up to 90 countries on 14 and 28 Mc. SZY had FB score in c.w. tests. MLG and DUC are DXing. IFW is recuperating from operation. MVK has applied for OPS appointment. Pomona High School Radio Club, under direction of QE, had field trip and emergency drill on Carbon Canyon Hill. ARV won the prizes; BMH was second. ARV, BMH, ZFZ, ZGY, and ZHA are licensed members. Club call is YMY. YAM, prewar K6MBT/MEG from Wheeler Field, is on 7 Mc. OQX is EC for Santa Barbara. IOX lost a tower in windstorm. Traffic: W6CMN 397, IOX 371, RXT 128, AKS 84, ZMZ 81, FYW 35, QIW 20, MU 15, KEI 14, MEP 8, AM 7.

ARIZONA — SCM, Gladden C. Elliott, W7MLL — MAE operates his 3.5-Mc. rig on batteries. REO, at Winslow, and LBN, at Globe also are independently powered. New OES appointees are UCQ, KXC, LWP, LSK, JZS, and MAW. LBN is OBS and OPS. LPA is ORS and works into West Coast nets. OWX has an English surplus 144-Mc. receiver. LIZ has a McMurdo on 28 Mc. QAP has a new 144-Mc. super, home-built. LLO has a battery-operated 144-Mc. converter for mobile work. LQK is on 144 Mc. at Globe. PEY reports 92 countries worked and a new "V" beam. MAW worked 20 countries his first month on the air. UPF is using n.f.m. on 14 Mc. LVR has a kw. on 28 Mc. PBD has completed more than 120 contacts with KG6AW/VK9. LQG is on 3.5- and 7-Mc. c.w. at Winslow and has a walkie-talkie that covers 3.5 and 144 Mc. REO has a 522 on 50 and 144 Mc. New Tucson hams are: LZV, 14-Mc. c.w.; MED, 7-Mc. c.w.; LZA, ex-9ESU, 14- and 28-Mc. 'phone; MDM, 28-Mc. 'phone; MBK, 28-Mc. 'phone; MDK, 28-Mc. 'phone. UPR has a 60-ft. tower for his four-element beam on 28 Mc. JPY reports activity in the VE Contest and F8EO and SP1AR on 7-Mc. c.w. UMG has p.p. 812s on 28 Mc. QNC is active on 28 Mc. LVG and MAT worked Tucson from Vail and Oracle.

SAN DIEGO — SCM, Irvin L. Emig, W6GC — Asst. SCM and SEC, Gordon Brown, 6APG. A new traffic net, known as the Border Net, has been organized by the RM, BGF, with help of LYF. The purpose of this net will be to train operators in net procedure. Net will meet at 9 P.M. on 3550 kc. with all comers welcome. Tie-ins are with Pioneer and Southern California Nets. WUW soon will be on with 700 watts of n.f.m. on 28-Mc. 'phone. FMJ reports a nice traffic score from participation in the Mission Trail Net. CHV sends in news from La Jolla. EWU is interested in television. A fire did considerable damage to PDP's shack. BAM made postwar DXCC. Orange County Radio Club's code class is going FB. DEY has a 522 on 420 Mc. and reports a number are successfully using 522s on 420 Mc. by tripling in final 832. BVA will shortly be on 420 Mc., as will CGF. The Orange County Club has an FB net on 420 Mc. every Monday at 7 P.M. The Imperial Valley Amateur Radio Assn. did a bang-up job of selling amateur radio at the annual Mid-Winter Valley Fair using the call of CNQ/6. This club meets the second Thursday of each month at 7:30 P.M. at the El Centro Chamber of Commerce. AWW, BGC, BLL, and YXI are active on practice net on 3750 kc. VCD s building a new and super VFO. CAI and UXX are on 28-Mc. 'phone. KW is chairman of San Diego Council of Radio Clubs. CCK can QSY almost anywhere in 28-Mc. band with surplus crystals. The San Diego Chapter of the YLRL had its first birthday in May. A new member of YLRL is 2TYM/6. QMN is heard on 7 and 3.5 Mc. with ARC-5. ESN suggests a One-half DXCC Certificate. If interested in ORS appointment or net operation, contact RM BGF. If interested in EC work, contact SEC APG. Traffic: W6CNQ/6 445, BGF 122, LYF 44, CNQ 23, CHV 20, WUW 14, FMJ 12, BCU 9, APG 2, BAM 2. WNN 2.

WEST GULF DIVISION

NORTHERN TEXAS — SCM, N. C. Settle, W5DAS/MNL — We welcome OGS, of Commerce, and OJC, of Dallas, into the ham fraternity. LGY keeps plenty busy with schedules, rag-chewing and OO work. The Dallas Club has completed its mobile emergency unit and will participate in Field Day Tests. NSG is chasing gremlins out of his new equipment. Your SCM has spring fever and has decided on a fishing tour. Boy Scout work is QRMing schedules of CDU. NTX C.W. Net intends to operate throughout the summer months on a reduced schedule basis. NPU sticks to 28 Mc. most of the time. GYW finished rebuilding and works 3.5-Mc. c.w. and 3.85-Mc. 'phone nets. BNQ is back on 3.85-Mc. 'phone. CC keeps Denton on the 3.85-Mc. 'phone map. JDZ has a new Signal Shifter. ISD is very busy with his work. GZU has taken on more traffic schedules. LTP is getting to be an authority on beams. EVI complains of too much work and not enough time. AMX and CDU, both ex-9s, renewed acquaintance after a lapse of 25 years. ARK,

(Continued on page 100)

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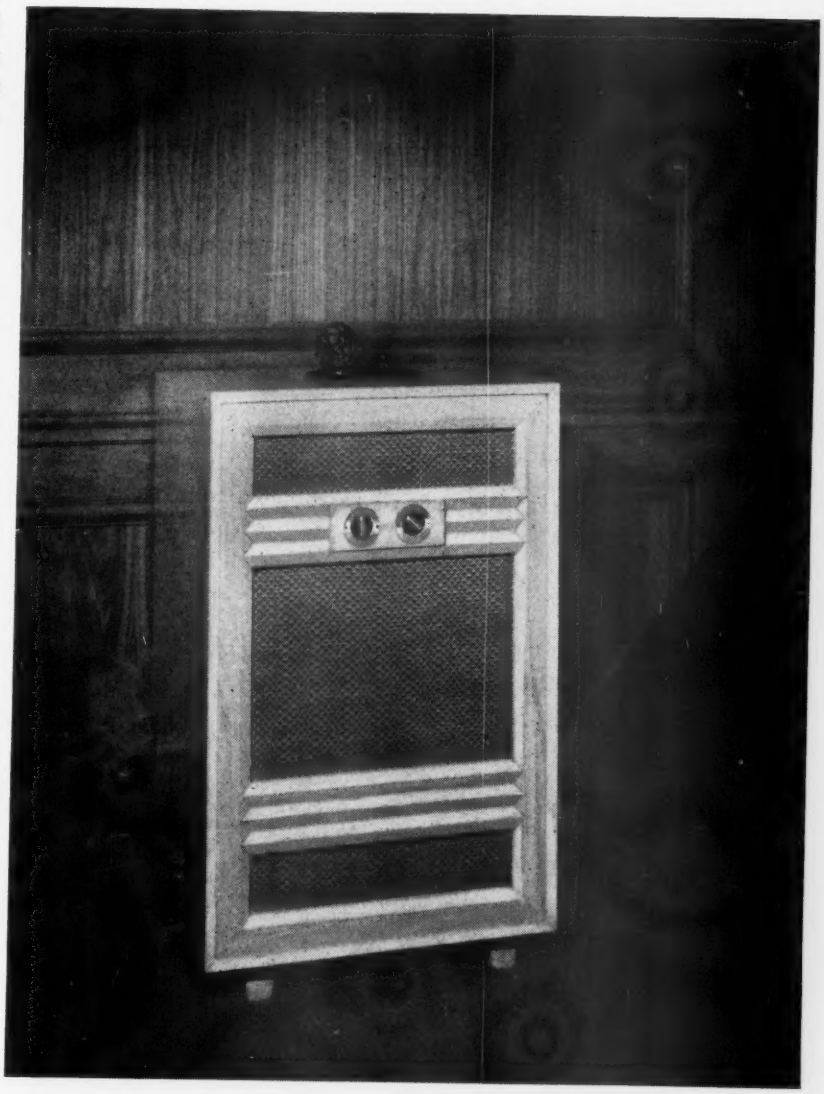


Jensen

CUSTOMODE REPRODUCER

Chicago

Ft. Worth, is getting hot with traffic handling. NW maintains activity on 3.85-Mc. 'phone. No report was received on 144-Mc. activity. While B.C.I. complaints in Dallas are few, the DARC is promoting a coöperative plan between amateur, B.C.L. and radio servicemen to improve public relations. Thanks to LGY for sending the one lonely report for this column. Please send along items of interest. Traffic: W5LSN 947, GZU 231, CDU 220, ISD 28, ARK 15, ILZ 13, LGY 6, ASA 4.

OKLAHOMA — SCM, Bert Weidner, W5HXI — Asst. SCM, George Bird, 5HGC. SEC: AHT. The outstanding news of the month was the service rendered, by amateur radio, to visitors to the Easter Pageant on the Wichita Mountains near Lawton. The Lawton-Ft. Sill Radio Club had a portable station on the site from Saturday noon until Sunday morning. NGF was in charge until he collapsed Saturday evening. Traffic from the portable station was forwarded to Lawton where IGO on 3.5, MDV on 7, and GCM on 14 Mc. relayed to the various nets. Over 700 messages were cleared to OLZ, the Rebel, and other nets. The following are new members reporting into the 8th Naval District Amateur Net: AIA, AZS, BAR, ERL, FL, HFX, HGC, IGO, IWW, KXD, LFJ, LLY, LTY, MFD, MPV, MRB. NFV is working on A. & M. emergency equipment ATJ has new crystals for OLZ and 'phone net. NMN has appointment for CAP. While KDH was looking for another station for emergency work in Pawnee County he contacted KEL, from Cleveland, who was on a boat in the Mediterranean. The A. & M. College 7050 Club may be heard on Sundays. LTN has modified a 348 until it is almost a frequency standard. The Kay County Club hopes soon to have mobile contacts with all members. HFW now has a brother on the air in New Mexico. The 8th Naval QSO Party on 7 Mc. was well attended. IGO reports into TL "K." GVS and AQE report into TL "H." Traffic: W5IGO 443, GCM 254, NMM 198, AST 177, NBD 135, GBS 127, GVS 127, PA 70, AQE 29, IOW 25, LTF 22, FRB 10, ADC 9, GOL 8, EHC 7, ADB 2, EGJ 2.

SOUTHERN TEXAS — SCM, Ted Chastain, W5HIF — SEC: BUV. RM: DAA. PAM: EYV. Networks: STEN, STTN, STEN (c.w.). GLS reports from Houston that 144-Mc. activity is going strong. KFD is running 300 watts. NQA is on 50, 28, and 144 Mc. ADZ is mobile on 144 Mc. and operates on 14, 28, and 50 Mc. GLS has installed 829B in BC-522 and has six-element beam with RC-148 preselector. There are between 55 and 60 active stations on 144 Mc. in the Houston area. IGL, KFY, and MRV are active on 50 Mc. DAA and SM are co-holders of Gulf Coast 144 Mc. DX record, Beaumont to Kingsville. The Corpus Christi Radio Club recently elected the following officers: LOW, pres.; FBC, vice-pres.; AQK, secy.; LOF, treas.; NPA, act. mgr. Active on 144 Mc. are AQK, LOW, EXO, and NIF. HQR now has WAS and WAC Certificates. New stations on 3.85 Mc. are DCP, LOW, MJQ, and IBT. DAA reports from Kingsville that LUJ and ACL are new members of the South Texas Traffic Net. MXV, in Mart, lost his antenna poles in high wind. MJN now is located in Houston. NKD has Class A ticket and is on 3.85-Mc. 'phone. LGL is new ORS. Mr. Sparky Barton, editor of *STENSCOPE*, recently was presented with a new NC-173 for outstanding service. Congrats to IU for one year of 100 per cent attendance in net drill. HZJ is active on 3.85 Mc. New call in Freeport is OFQ, who holds a 20-w.p.m. Code Proficiency Certificate. MPE has recovered from a bad attack of pneumonia. EWZ worked 36 countries during DX Contest. JKB has new three-element wide-spaced beam and started working DX the minute he put it up. NIY reports that 3.5 Mc. gave better results than 14 Mc. during the DX Contest. Congrats to ACL on the arrival of an 8-lb, 1-oz. jr. operator. PM, ex-DAQ, has new beam and reports 99 countries. Active on 50 Mc. in San Antonio are: BUV, JLY, VY, LBG, LIV, UB, and AJD. The 144-Mc. gang is BUV, JLY, YV, LBG, and LIV. NFC is active on 144 Mc. in Austin. In Seguin FFG is active on 144 Mc. and 3.85 Mc. Will the ECs please get reports in regularly to the SEC. Traffic: W5MN 219, DAA 83, MXV 81, LWV 12, JPC 9, ACL 6, GLS 5, EWZ 4, HQR 3, NIY 2.

NEW MEXICO — SCM, Lawrence R. Walsh, W5SMA — SEC: ZM. RM: HJF. PAM: FAG. This month the 75 Fone Net got off to a fine start with FAG as NCS. Those reporting in were ZM, HJF, NXE, and SMA. MYQ just missed because of jr. operator troubles. I would like to urge everyone who can put a rig on 3880 kc. to join the net. The time is 8:30 A.M. the 1st and 3rd Sundays of the month. The Los Alamos Radio Club elected the following: NXE, pres.; NAS, vice-pres. and act. mgr.; MNW, secy. and treas. Plans were made for Field Day. The N.M. Bulletin (*CQ N.M.*) started with a fine first issue. Congratulations, Bob. KAO is now e.c.o. with 500 watts on all bands. NQU will be operating portable on 7 Mc. in Arizona and California. NQT will be on 3.5, 7, and 14 Mc. from S. New Mexico and Santa Fe. JYW is studying with CREI but completed WAS. HOX and MBF are members of slow speed trunk line on 3545 kc. We would like to welcome OGY to New Mexico. MYA is now on 3.5 and 7 Mc. Barney plans to handle traffic from Fort Bayard. NKG sent in a list of constructive suggestions for net procedure. Appointments:

(*Continued on page 104*)

NSATIONAL VALUE! Save up to 50% on Factory wired HAMMARLUND GEAR

FOUR-20
ANSMITTER
eady to go
AS $120.00
r price only

59.50

mplete with tubes
nd 10-meter coil

FOUR-11
MODULATOR
Ready to use
WAS $72.50
Our price only

$49.50

Use it with your present rig or your new Four-20. Gives you eleven watts of audio with less than 5% distortion.

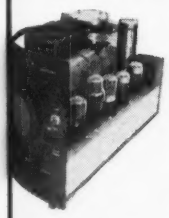
ves you all-band, crystal-controlled, phone or CW eration — 80, 40, 20, 11, and 10 meters.

ils for 11-20-40-80 meters .....each $1.70
ystal for Four-20 (Bliley or Valpey) $2.80

Your chance for even greater savings!
Four-20 kit with detailed pictorial instructions for your own assembly .....only $39.50

r full details on these amazing values in Hammarlund gear, see our advertisement in QST, March.

C-929-A 'SCOPE $12.95



This 3-inch radar-type scope is readily modified to use as a modulation indicator or a panadapter. You can run it on 60 cycles by hooking a 150-watt lamp in series with the input to the 400-cycle power supply. Handy size—8 x 9 x 14 inches. Complete with 3CP-1 CR-tube, 2—6H6GT, 2—6SN7GT, and 1 each 6G6G, 6X5GT, and 2X2. Good used condition.

-221 FREQUENCY STANDARD

36.95

damental ranges
50 and 2000-4000
stability better
0.005%. Com-
e with tubes,
al crystal and
ation charts.
but excel-
working
ion.

UBE SPECIALS — All brand new!

EIMAC 304-TH	$3.95 ea.	6 for $23.20
807	$ .95 ea.	3 for $2.60
866/866A	.75 ea.	6 for 4.10
3C24/G	.49 ea.	6 for 2.25
6C4	.15 ea.	
6AK5	$13.50	

Minimum tube order $2.00

CAPACITOR SPECIALS

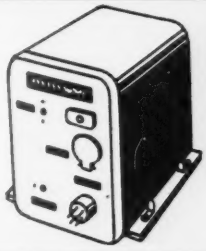
stinghouse 8 mfd. 2000 v.d.c. Iner-filled capacitor. Sealed metal e has mounting feet, screw termi-, porcelain standoff insulators.
Price $2.49

Capacitron 2 mfd. 1000 v.c.d. Round can, single-hole mounting, single-terminal style, case common to one side of capacitor.
Price 29c each 10 for $2.49

BC-746 TUNING UNIT $1.19

Brand new. Adaptable to use with midget xmtrs on 80 meters. Consists of 140 mmfd. variable condenser, coil, and 2 crystals, in case only 3¾ x 2¾ x 1⅛ inches.

MARKER BEACON RCVR BC-357 $2.95



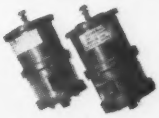
Just the thing for experimenting with radio-controlled devices of all sorts. Two-tube receiver operates built-in SPDT relay from modulated signals. Includes 2 tubes and relay. You couldn't build it for this price.

Protect your rig with this HEINEMANN CIRCUIT BREAKER

89¢ each
10 for $8.50

Better than fuses. Carries starting surges but trips on sustained overloads. Resets at finger touch. Can be tripped manually and used as on-off switch. SPST; 4, 15, or 20 amp. ratings at 117 volts. Specify current. Brand new.

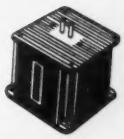
BRAND NEW GE SELSYNS $4.95 PER PAIR



Ideal for beam position indicators and many other uses. You can run these splendid selsyn control transformers at 35 volts 60 cycles and they'll give you permanent, efficient performance.

11-HENRY FILTER CHOKE

Kenyon T-160, brand new; 11 henries, 120 ohms resistance, carries 300 ma.; size 4 x 5 x 5 inches; mtg. ctrs. 4 3/16 x 3 3/16 inches. Price $2.49.



SCR-625 MINE DETECTOR

Buried pipes, manhole covers, electric cables, and other hidden metal objects are easy to find with this sensitive detector. Works down to about 6 feet. Furnished with full set of tubes and batteries. Good used condition.

$49.50

HIGH SPEED BLOWER $4.95

Ideal for forced-draft cooling; 1/100 H.P. 27½-volt d-c series motor drives sirocco-type blower at 7000 RPM—we ran it on 27V-AC all day without injury.

The RADIO SHACK Corp.

CABLE ADDRESS - RADIOSHACK
167 WASHINGTON ST., BOSTON, MASS., U.S.A.

(Continued from page 100)

MYA, EC. Traffic: W5NXE 108, ZU 95, HJF 27, HOX 23, KAO 3, MYA 2.

CANADA

MARITIME DIVISION

MARITIME — SCM, A. M. Crowell, VE1DQ — RM: GL. SEC: FQ. FLASH! The big reunion and banquet will be held over the Labor Day week end at St. John, under the direction of the LCARC. EW is working on new 14-Mc beam. NT gave the LCARC gang the dope on the 28-Mc mobile rig. IF has given up the AT-7 for a crystal job. IW piled up nice score in VE Contest. FU has junked the AT-7. Shore Radio Club officers are: LR, pres.; OY, vice-pres.; NA, secy.-treas. The HARC booth at the YMCA Hobby Show at Halifax was a huge success. FQ, on 14-Mc. 'phone and LZ, on 3.5-Mc. c.w., with T/L operating by HJ using the HARC call of FO, handled traffic as far west as Vancouver and Victoria. BC is back on 3.8-Mc. 'phone with low power. FG is back on 3.8 Mc. OD and CR are building 14 and 28-Mc. beams. DM is on 28 and 14 Mc. JA has new Command set, VFO, and n.f.m. on 3.5 Mc. PX is on 3.8-Mc. 'phone. QR is on 28 Mc. EK is going high power with 829-B. VO6EP has 54 countries from new QTH. HV now is 3GQ. SP, IH, and PT are active on 14 Mc. DQ finally went VFO ES is working on war surplus generator as supply for his S-40 emergency receiver. Traffic: VE1FO 54, DQ 8, FQ 6, PX 6.

ONTARIO DIVISION

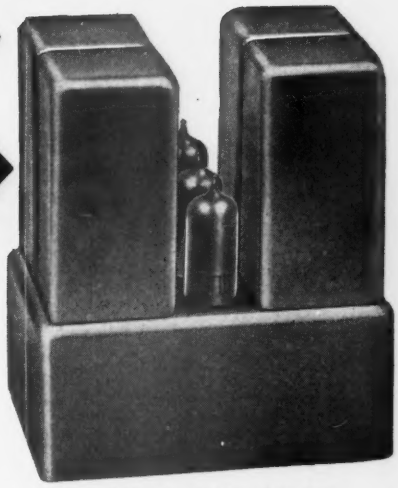
ONTARIO — SCM, David S. Hutchinson, VE3DU — Hamilton, Toronto, and Windsor Clubs are making great plans for Field Day. BAJ and BCP keep Pagwa on the air. BCP is organizing a net for D.O.T. Radio Range operators, 7167 kc., 1900 hrs. "QDT" is general call used on the net, with Pagwa, Nakina, Armstrong, and Earlton represented at present. It is hoped to have every airport across Canada tied in with this net eventually. BCP is new ORS and NI new OPS. AQE is working DX on 28-Mc. 'phone. AGC hit the 100 mark in countries worked on 14-Mc. c.w. ANS can run his 28-Mc. 'phone from the bed. Officers of Kingston Club are: GO, pres.; AOU, vice-pres.; BBY, secy.-treas., and GI, AKR, and BTH, entertainment committee. BTH is on 14-Mc. c.w. with 100 watts. AXR and GI are trying out 144 Mc. The Brockville Hamfest will be held July 4, 1948. CP has worked 8 countries on 3.5-Mc. 'phone. OPN meets each Sunday at 9:30 A.M. Through the efforts of ATR, the boys on OPN, QBN, and TL "I" have been kept busy with traffic this month. Hamilton 144-Mc. net is working FB. A new club has been formed in Sudbury with the following officers: AXE, pres.; BBC, vice-pres.; BUS, treas.; and AOG, secy. New officers of Wireless Assn. are: KA, pres.; MT, vice-pres.; and TC, secy.-treas. BIF worked KH6 on 27 Mc. and AZI, APA, and ATP on 3.8-Mc. 'phone. MT worked J2AMA and keeps schedule with VE8MB. BQM is on 14-Mc. 'phone. AUW has new rig with VFO and 811 final. ABP, AQA, BNQ, BMG, BQF, AVK, BIK, CJ, BKR, and BFF keep Hamilton on 28 Mc. along with TG, SP, AQS, BHX, BHS, JU, YR, ARB, AKW, AYR, and QU on 14 Mc. QU now has 70 countries and BHX 44. BIK has his cards for 'phone WAC. Traffic: VE3ATR 550, AWE 195, DU 193, BMG 136, GI 116, AWJ 98, XO 73, BUR 56, EF 50, TM 45, WX 45, DH 27, VD 26, BCS 25, CP 25, WK 22, KM 16, BCP 14, AFW 5.

QUEBEC DIVISION

QUEBEC — SCM, Gordon A. Lynn, VE2GL — RM with only 25 watts, worked VP6CDI and a G on 3.85-Mc. 'phone. TM schedules DL daily. HB and TM had a visit from VE3BIF and moved traffic to BIF's home for him. RL worked ON, G, and F on 7 Mc. recently. OL has 90 watts to 807 on 3.5-, 7- and 14-Mc. c.w. and recently worked worked J3AAD to make WAC and his fiftieth country; he also has 47 states towards WAS. CA, using n.f.m. during the DX Contest, had 51 contacts in nine hours and is convinced that n.f.m. is as good as a.m. even during contest conditions. BB schedules LO and W2OUT, and also SSTL (slow speed trunk line) on 3545 kc., 7:30 to 8:30 P.M. daily and invites others who may be interested to get in touch with him on the air or by phone. EC maintains several schedules on 3.8-Mc. 'phone. DD is back on 3.8-Mc. 'phone. OD and ABJ schedule each other on 50 Mc. and KY and ZG are on 144 Mc. XB has AR-6 receiver and is rebuilding rig but maintains schedules with VE3WK daily at 6:10 A.M. LO reports results on 3.5 Mc. as only fair. BE and SA did good work handling traffic with Quebec City during the period when all land-line communication was interrupted because over 800 poles were down between Montreal and Quebec in the recent freezing rain storm. XX has replaced 812s in final with TZ40s. VE1AQ is located in Montreal and is looking for shack. He still goes home to VE1 Land to work rig some week ends. TA is heard on 14-Mc. c.w. ABT is on 7-Mc. c.w. He is only 13 years old! Traffic: VE2GL 33, BB 29, EC 27, XB 15, TH 11, TM 6.

(Continued on page 106)

McMurdo SILVER the "NEW LOOK" in SELECTIVITY

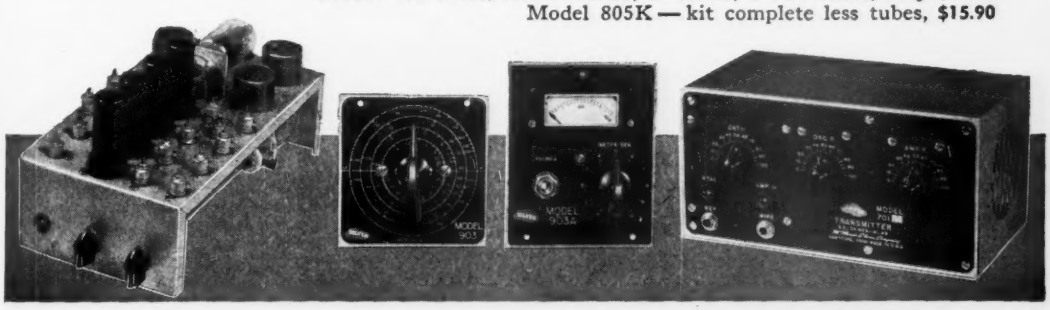


Philip Rand started a new trend to real, badly-needed receiver-selectivity with his Q-5er. Byron Goodman carried it forward with his "Lazy-Man's Q-5er". We applaud both steps, but felt that even more could be attained by *special design* to really give every ham super-het, new or old, the "New Look" selectivity QST advocates.

Our answer is Model 805, 100kc. I.F. Amplifier. Connect it between your last i.f. secondary and your audio volume control and you get a small boost in gain. But what you *really get is* single-side-band selectivity — a selectivity curve 2.4kc. wide across the flat top, skirts falling so steeply as to be only 4.7kc. broad 1000 times (60 db.) down, only 7.2kc. wide 10,000 times down! As Byron Goodman says of this *new look* selectivity, it will "cut thru the QRM and pull out the desired signal like nothing you ever saw or heard".

Take Model 805, only 3 7/8" wide, 4 15/16" long, 5 5/8" high, make 6 simple connections to your 455/465 kc. i.f. receiver, (which can usually supply 6.3 V. a.c. at .75 Amps. and 110 to 250 volts d.c. at 25 ma. to the 805) and you *have that* post-war receiver with the "new look"

Model 805 Price, less 1- 6BE6, 1- 6BA6, 1-6C4 tubes, only **$18.90**
Model 805K — kit complete less tubes, **$15.90**



703 FREQUENCY MULTIPLIER Model 703 Pre-Tuned Band Pass Frequency Multiplier is now in stock at all progressive amateur jobbers. All you need is an 80 meter v.f.o. or xtal oscillator putting out about 1 watt to drive 703 — which, at the flip of two knobs, gives you 40 watts output 80 thru 10 meters, 20 watts on 6 meters. Whether you use it to feed an antenna tuner directly, or to drive a kilowatt "final", Model 703 short-cuts all usual intervening doubler stages — replaces them with a compact, *quick* means of getting anywhere in any band 80 thru 6 meters in a jiffy. Net price, less 2 — 6AG7, 2 — 6L6, 1 — 807 tubes, and 300 volt, 250 ma., 400 to 600 volt, 100 ma. power supply is only **$49.90** net, ready to go.

903 WAVEMETER & 903A FIELD STRENGTH METER That Model 903 absorption wavemeter nicely meets a basic amateur need is proven by the thousands in use. "HANDBOOKS" have recommended such a wavemeter with crystal rectifier and meter for visual indication and field strength measurements. We are glad to offer Model 903A companion meter-rectifier unit — for direct attachment to top of 903 panel.

Model 903A matches, and becomes part of 903 wavemeter, to which it adds 1N34 rectifier, new Silver 0-1 ma. 0/100 division meter, meter sensitivity control and phone jack— to make the sweetest wavemeter and field-strength meter we've seen. 903 wavemeter is **$3.30** net; plug in coils, 1600 kc. to 500 mc., **$.65** each net. Model 903 A Rectifier-Meter Panel is **$14.50** net.

701 TRANSMITTER, 75 WATT CW, 30 WATT PHONE Following "HANDBOOK" teachings for maximum transmitter efficiency vs. cost and complexity. 701 Transmitter has proven itself in tens of thousands of QSO's. Compact to save space in home or mobile installation, it's the sure-fire answer to 75 watts of clean CW, 30 watts of AM phone signals. A 6AQ5 xtal Tritet drives an 807, 80 thru 6 meters. Two 6AQ5's turn out 14 watts audio to 100% speech modulate 807 plate/screen. Power supply requirements are satisfied by Model 301 Power Supply for 40 watts input or by a simple "HANDBOOK" assembly for 75 watts input.

We think you'll agree that 701 is the trimmest, smallest "powerhouse" you've ever seen. Price less tubes, coils, power supply only **$36.95**; coils (3 per band) **$.50** ea.

See these and other McMurdo Silver communication apparatus . . . and famous LCETI test instruments . . . at your favorite jobber.

OVER 37 YEARS OF RADIO ENGINEERING ACHIEVEMENT

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VANALTA DIVISION

ALBERTA — SCM, W. W. Butchart, VE6LQ — HM has been struggling to get beam motor operating. TA, of Hussar, visited Edmonton. He kept schedule with his XYL, KU, from LQ. WB returned to the air with 150-watt 'phone-c.w. rig. MJ patiently awaits arrival of African Q8L to cop WAC Certificate! BW has small compact rig using 815s in final and modulator. HI has trouble with B.C.I. KN experiments with n.f.m. JG has returned to 3.8-Mc. 'phone. AH is convalescing from recent illness. CJ is recent ORS appointee at Raymond. BN spent a few days in the hospital and QS kept his schedules. The CARA is staging Alberta Hamfest July 31st and August 1st. GD has moved the Gyp-joint to more spacious quarters. MP and HZ are taking things easier since communications have been re-established by rail to the outside world. HQ's jr. operator Ron, has his own call now. XX, of Calgary, visited Edmonton on Credit Union Convention. QC has trouble with 28-Mc. harmonic from 14 Mc. JP got hold of a beam-turning motor from AC. AO will be busy organizing the Alberta Hamfest this year. NARC staged a successful Annual Dinner, with several out-of-town visitors present. Traffic: VE6WG 105, LQ 26, QS 25, BN 15, MJ 4.

BRITISH COLUMBIA — SCM, W. W. Storey, VE7WS — New officers of Vernon Amateur Radio Club are: VT, pres.; JW, vice-pres.; Al Saunders, secy.-treas. AJF is BCARA representative, FT, technical director, HW, director. JW just got an FB commercial cabinet. LP got a new call on trying out his new ground plane antenna. VT is going nicely on 14-Mc. rotable beam. FT is on 3.8 Mc. after a long absence. AJF is still on 3.8-Mc. c.w. using a special inverted L antenna. KQ is active once more. NF, chief engineer of CJIB, is building a new rig and expects to be on 3.8-Mc. 'phone. SO is still on 3.8-Mc. 'phone using 810s and hopes to get the rig on 14-Mc. 'phone. AFP is a newcomer to Vernon. HP has new high-gloss beam antenna and is sporting a new pair of 813s in the final. Jim has worked 69 countries since 1928. TQ would like to know what country uses the call letters R V2. If you know please drop him a line, fellows. The SCM still is looking for those activity reports, fellows. OJ was heard on 28-Mc. 'phone. MH also arrived on 28-Mc. 'phone; he is using cathode series modulation. UU is working on bandswitching c.w. rig with 813 final. BE was heard working a KH6 on 7-Mc. c.w. ABP is pounding brass on 7 Mc. AZ is building VFO. from tuning unit from BC-610. LF is back on 7 Mc. WH and AGP are active on 7 Mc. XT is on 14-Mc. c.w. Ex-5JS now operates as 3AQP on approximately 7030 kc. SW sends official bulletins Mon. and Thurs. at 1800 on 3650 kc. Traffic: VE7SW 91.

PRAIRIE DIVISION

MANITOBA — SCM, A. W. Morley, VE4AM — Congratulations to DQ on his fine emergency work for the Dept. of Mine and Natural Resources. Harry maintained schedules for them when their equipment became unserviceable. In between time he managed to work the odd bit of DX, snagging VE8NA, G3QV, and G2CUI. SR and RP handled emergency message from Churchill. TM is working on a CPA Net on 7 Mc. and so far has 5DW, 5EM, and RE lined up. RO, on his first night on 3.5 Mc., worked a ZL and KH. Next night George tried 'phone and came up with VP6. GE and JO have been heard in G Land on 3.85 Mc. PA has the 804 he won at the hamfest. SS got his CPC and then got his license endorsed for 'phone. The WARC elected TJ, pres.; QV, vice-pres.; Leon Young, secy.; and LC, treas. The club meets the fourth Friday of each month in the Free Press Bldg. BM has retired and after a trip East will be heard from VE7. JM is putting out OBS on 3800 Mon., Wed., and Fri. at 10 P.M. CST. This service is being extended to 7 Mc. with a broadcast on c.w. at 12 noon every Sunday. Who wants to cover 144 Mc.? Don't forget the Go-Pher Hamfest at Nicollet Hotel, Minneapolis, June 18–19. Traffic: VE4AM 139, DN 10, EA 8, HS 8, CI 4, MM 3, TM 3.

Strays

W3BQ takes us quite literally. Responding to the recent *QST* appeal for press clippings about hams, he sent in, with tongue in cheek, one that described a fire in which 37,000 hams perished — property of Armour & Co.!

ALWAYS SHOP 'NEWARK' FIRST AND SAVE

Build your own SSSR Adapter Unit with this BASIC KIT

Basic Components for construction of Selectable Single Sideband Reception Adaptor, patterned from J. McLaughlin's article in April QST.

50 Kc IF TRANSFORMERS (T-1 and T-2) for moderate selectivity. 2 required — type 1898A. Cat. No. 7690. Am Net, per pr. **$9.00**

50 Kc IF TRANSFORMERS (T-1 and T-2) for super selectivity. 2 required — type 1898AX. Cat. No. 7691. Am. Net, per pr... **$9.00**

50 Kc LOW PASS FILTER. type 3423. Cat. No. 7692. Amateur Net **$6.00**

BLILEY MATCHED CRYSTALS (type SR10). 2 crystals mount in single octal tube socket. Frequency supplied 405.5 Kc and 505.5 Kc + 0.5 Kc. Frequency difference each pair is 100 Kc + 100 cy Cat. No. 9412. Am. Net, per pr..... **$10.80**

COMPLETE KIT of basic components consisting of either Two #1898A or Two 1898AX IF Transformers, One Low Pass Filter #3423, and Two Matched Bliley SR10 crystals. Cat. No. R-131 **$25.28**

New MILLEN SSSR92105 Single Side band Receptor in Stock! Cat. No. A-19407. Amateur Net **$75.00**

$15 Down — 12 Months at $5.30

Smashing Reduction!

HAMMARLUND FS-135-C FREQUENCY STANDARD

$69.95 with Tube & Crystal

(Formerly $14.25)

Be Sure You're in Your Band! With this tiny (2"x2") unit comply with Sec. 12.135 of the F.C.C. rules. Your receiver becomes an accurate frequency meter. All Brand New — Guaranteed. Complete with 6AK5 tube, 100 Kc Crystal, and instructions. No. S-774

Use Your CREDIT. Take ONE YEAR to Pay

NEW LOW PRICES

TRANSVISION TELEVISION KITS

NOW you can get all the Famous Transvision TV Kits, Assemblies, and Parts at Prices never before possible; Choose your Kit and TAKE ONE YEAR TO PAY.

Cat. No.		List Price	Newark Price
A-19494	10BL, 110 Sq. in. pict. TV/FM, cabinet & lens incl.	359.00	**299.99**
A-19495	12BL, 130 sq. in. pict. TV/FM, cabinet & lens incl.	389.00	**319.00**
A-19505	10" Standard (5 ch.)*	225.00	**189.00**
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A-19508	15" Std (with FM)**	372.95	**310.00**
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*Television sight and sound only **Television plus FM Radio, 88-108 Mc ***With Inductuner — 13 TV channels plus FM radio, cont. tuning 50-216 Mc

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Regular Price $72.50. Kit includes All Parts, Materials, Punched Chassis, Cabinet, Hardware, Tubes and Instructions. All Genuine Hammarlund parts with schematic and parts list. Use this modulator with your present rig, as a high power speech amplifier or with the Hammarlund Four-20 Xmitter.

● 11 Watts Audio Output ● High Impedance Mike Input ● 8000 ohm output to match Four-20 ● 110 DB Gain ● Substantially flat in speech range 200-3000 cycles. Drops off sharply above and below ● Tubes: 6SL7GT (1st and 2nd AF), 6C5 (Phase Inverter), 2-7C5LT (PP Power Output), 5U-4G (Rectifier).

Cat. No. S-713, Complete Modulator Kit for 105-120 V, 50/60 cycles. Shpg. Wgt. 41 lbs. **$29.50**

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Channel mtg; 2¾" betw. mtg ctrs. 6.3V @ 1.2 Amps. Fully impreg. Wire leads. Pri: 110V 60 cy. No. S-784 ONLY ..... **88¢**

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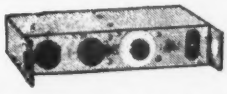
Built to Navy specs. 85 ohms DC resistance. Ceramic standoff insulators. Fully enclosed, with 4 studs mtg. on 1¾x2½" centers. Exceptional quality heavy duty choke. High voltage insulation. 3⅝x4⅛x2½"D. Shpg Wgt. 5 lbs. Cat. No. S-595. Special..... **$1.49**

TUNING UNIT for BC-610



Swell for Hams! Contains 3 midget variable cond. Easily converted to VFO or ECO basic unit. Externally mounted 6AC7, 6L6, 807 used in conversion to make 25-40 watt xmitter-exciter. Used in BC-610 and Hallicrafters HT4. 9x6¼x2"D. Shpg wt 5 lbs. Cat. No. S-596 ONLY..... **$1.19**

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Amplifier Instability

(Continued from page 24)

and suggestions given in the text. *Don't* use a suppressor resistor at the screen. If a similar choke in the grid lead of a triode doesn't work, use a trap in the plate circuit.

2) In balanced circuits using triodes or audio pentodes, eliminate the low-frequency parasitic circuit by substituting a 100-ohm resistor for the customary choke in the grid circuit, plate circuit or both.

3) Neutralize tetrodes for reliable stability at the operating frequency.

4) In push-pull amplifiers, balance the excitation to the two tubes carefully, matching screen currents as the indicator with beam tubes.

5) Don't overdrive 807s or other tetrodes.

It really isn't too tough.

I. A. R. U. News

(Continued from page 35)

national Relations Officer, Union Schweiz Kurzwellen Amateure, Berne (Postbox), Switzerland.

NETHERLANDS EAST INDIES

The *Nederlandsch-Indische Vereeniging voor International Radio-Amateurisme* is now undergoing a major postwar reorganization. The headquarters has been relocated at Batavia, where it was situated before the war. The new headquarters staff is composed of the following: president, Major F. A. Robertus, PK1FR; vice-president, Mr. W. P. Heespelink, PK1XW; secretary, Sgt./Major J. A. v.d. Berg, PK1YL; treasurer, Sgt./Major B. Schapp, PK1BS, and director, Lt. Comdr. J. C. Holman, PK1HL.

For administrative purposes, Indonesia will be divided into seven districts, PK1 through PK7, N.I.V.I.R.A. members in the 2nd, 4th, 5th and 7th districts will be represented by a delegate from each district. PK3 and PK6 will be represented by a district staff. PK1 will be divided into two areas, each having its own district staff.

N.I.V.I.R.A. major objectives are to establish a strong central society, to reëngage in the affairs of the I.A.R.U., with particular emphasis on the resumption of mutually-advantageous relations with its sister societies, to bend every effort to obtain literature much-needed to effect the rehabilitation of Dutch radio amateurs, and to strive for restoration of amateur radio privileges to all PKs.

For the present, because of the unsettled political situation in the Netherlands East Indies, no PKs in Dutch-controlled territory are permitted to operate. However, a few amateurs have been permitted to go on the air in central Java and other sections under the control of the Indonesian government.

The N.I.V.I.R.A. QSL bureau will be established at Bandoeng, Java, under the management of PK1LZ.

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Hallicrafters SX-42	275.00	National NC-33	65.95

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Want to make a happy swap? Just step into our Ham Shack—or drop a line to Dayton Warner (W9IBC) to get a square trade-in deal. Give us the dope, and we'll see to it that you get the most for your trade-in dollar. A good break for you is good business for us. 'Nuff said? Check with us before you trade—you'll do better at ALLIED.

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NATIONAL ARRL CONVENTION!

PLACE: Milwaukee, Wisc. TIME: Sept. 4-5-6, 1948. WE'LL BE THERE. Plan to attend this year.

25 Years Ago

(*Continued from page 46*)

tions instantly by the mere turn of a dial." Professor L. A. Hazeltine's Neutrodyne circuit, recently described, is further noted by G. L. Bidwell's reporting of a talk by the inventor's coworker, Harold Wheeler, as presented before the Washington (D. C.) Radio Club. Mr. Wheeler has given us new circuits for stabilizing r.f. stages through neutralization. A method of stabilizing the three-circuit regenerative detector by coupling a loading circuit to the grid coil is outlined by L. M. Cockaday, member of the ARRL Advisory Technical Committee and editor of *Popular Radio*.

Kilocycles or meters — how shall we describe the radio waves we are now using? Dr. A. N. Goldsmith, secretary of IRE, argues for the former. What say, gang — 1500 kilocycles or 200 meters?

Amateurs are responsible for only 5% of the interference to radiophone "broadcast" stations, according to a study of the Bureau of Standards prepared under the direction of one of its engineers, C. M. Jansky. Even with such a clean bill in hand, amateur radio is still agreeable to the voluntary observance of quiet hours; but not to their present unheralded writing-in as law in our new licenses. Our Board of Direction has protested to the Department of Commerce.

Two rousing conventions — the Third District's at Baltimore and the Eighth District's at Columbus, Ohio — have contributed much to our ARRL spirit, and where it is impossible for ham to meet ham in person, "Signal Report Cards," portrayers of "the friendly spirit of coöperation and good fellowship," are encouraged by *QST*.

Random gleanings: The Hoover Cup for 1922 has been formally presented to 2OM, station of F. B. Ostman, Ridgewood, N. J. . . . The E. T. Cunningham Co. announces a new detector-amplifier, Type C-299, price $6.50. . . . Strays puts the blame on vibrator-type battery chargers as a major source of BCI.

50 Mc.

(*Continued from page 50*)

elevations up to 8000 feet or more intervening, is also worked by the rebound method. Beams are aimed at the highest peak, which is about 10,000 feet above sea level. There is some 420-Mc. activity in San Bernardino. W6AOS uses a BC-788 and a converted 522, and W6RSN has a converted 522, a BC-645, and an ASB-5 receiver.

Oil City, La. — Louisiana representation on 50 Mc. this year includes W5ML, 50.2 Mc., W5DXB, 50.35, W5LET, 50.04, W5AEN, 50.01, W5IOP, 50.46, and W5JFF, 50.4.

Collierville, Tenn. — W4HHK says that quite a number of stations are on 144 Mc. in the Memphis area, but no contacts beyond 40 miles or so had been made up to the middle of April. He would like to hear from others within 150

(*Continued on page 114*)

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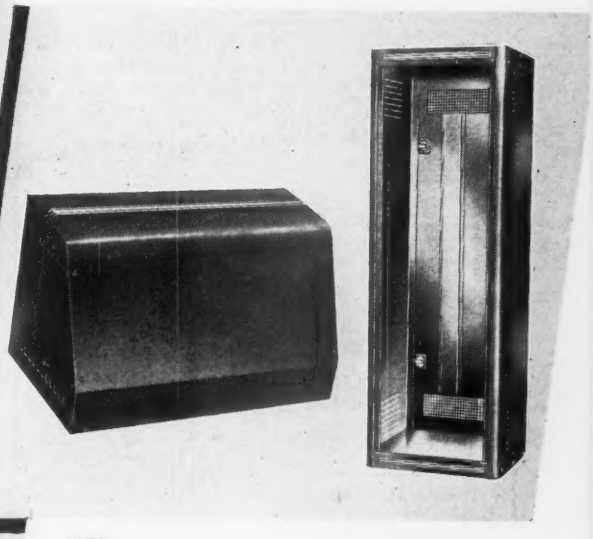

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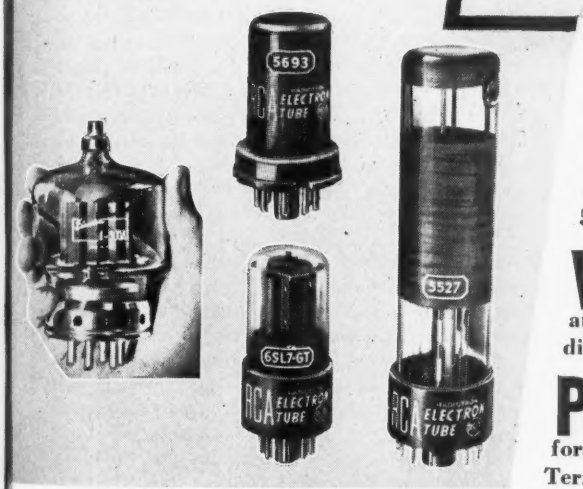

Tubes? We carry all numbers of well-known brands for receiving, transmitting and industrial use. Check with us for all type numbers of RCA and Eitel-McCullough (Eimac) tubes, also new RCA special long-life Red Tubes (5691, 5692, 5693).

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miles of Memphis who would be interested in maintaining test schedules. Vertical polarization is in use at present.

San Diego, Calif. — The 2-meter band suffers from an excess of prophets, according to W6ZDO. "Conditions poor tonight — no fog — too much fog — not hot enough today — not cold enough tonight — I don't hear W6XXX at his usual spot — no harmonics from so and so at such and such frequency — and so on, ad infinitum." Carle says that he has given up trying to tell about conditions by local weather signs as they often cross one up. The thing to do is to get on the air and call and listen, and *keep it up!* Operating from Point Loma, W6ZDO has worked W6QUK, San Bernardino, 100 miles; W6DYJ, Bakersfield, more than 200 miles; and W6BUT and W6PAW in Taft, also about 200 miles distant. W6MFK in Lancaster has been heard. All these stations are on the other side of very high mountains from San Diego. These contacts were made with a converted 522, using 829s in place of the 832s. The antenna was a coaxial dipole mounted on the car cowl. This is now replaced with a 4-element array which can be used either vertically or horizontally.

How's DX?

(Continued from page 58)

due time. "Please do not attempt to QSL at present." . _ . _ . _ CM2SW regrets that he'll not be able to QSL his Contest contacts this year — DXCC credit, if necessary, can be obtained from Sergio's submitted log . _ . _ . _ While operating /MM, W5LKH ran into this D4OH feller who has been worrying W1GKM. Rolf would bet his bottom dollar that D4OH is a Class A pirate . _ . _ . _ W4BA casually worked HK1FQ, HK1DZ and HK1GH on 14-Mc. 'phone not long ago and discovered that they are, respectively, father, son and employee in Barranquilla . _ . _ . _ Gadding about in Tokyo, WØEFK picked up word that Uncle Sam is putting some of his BC610s to work on other than ham bands now. Most future Js will probably have to whip up something from parts . _ . _ . _ People worrying about ZC6 QSLs can try a new address, Box 4099, Tel Aviv, now the official ZC6 bureau QTH. W3EIV volunteered this information and also claims he couldn't pull a QTH out of PX1A . _ . _ . _ When you QSL a station who gives you his location and address, but says he's undercover, you do *not* put anything pertaining to radio on the envelope (unlike a few we've seen). Make it look like anything else, a court order, a bill from Macy's, et al . _ . _ . _ Via W6AYZ, ex-VU2PB promises a QSL to anyone who worked him while he was in the Andamans (home QTH in a recent *QST*) and who hasn't yet received a card . _ . _ . _ YI2AM will not guarantee a QSL to anyone calling him in disregard to a directional CQ. He is also still very much undercover and wants no cards direct . _ . _ . _ A letter to W3DKT from ZC6AA complains about a lack of radio gear in Palestine. Unfortunately, shipments from Ws have no sure

(Continued on page 116)

route of entry. Active ZC6 stations, who now number ten, will diminish sharply upon the departure of the British . _ . _ . _ Joint operation of D4ARA, now discontinued, makes QSLing somewhat difficult. A former operator of that station, who is now operating D4ATJ, will attempt to confirm all contacts made by himself only as he does not have the complete D4ARA log. So if you worked "Whee" of D4ARA, QSL to D4ATJ with details . _ . _ . _ Nope, FE8AB is not a second Cameroons station, it's FQ3AT's new call. W1ODU was first with this news . _ . _ . _ AC4YN has had some new cards printed but is wondering who else is using his call — Reg gets a lot of pasteboards from stations never worked. GD2DF has the same experience. A word to the wise: *Don't* get too close to AC4YN's frequency when calling him. If you have a kw. and a rhombic on Tibet and can't seem to raise him each time you hear him, better give up. Or else write an apologetic letter to him — you may have slipped up in the past and Reg never forgets a greedy call. Thanks to W7EYS for these words . _ . _ . _ W6WNI has it that VS4WL is the only currently-active VS4, VS4VR having gone to VS1.

— . . . —

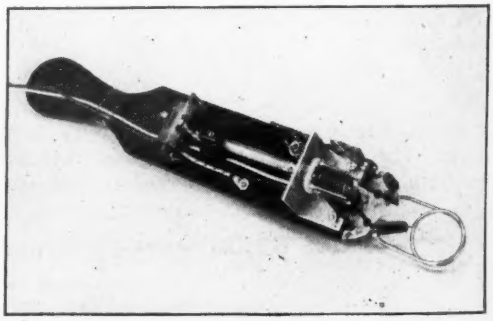
Jeeves is getting more sarcastic and cynical every day about our inability to work anything south of Key West. Now he's gone back to being an SWL — covers the pantry walls with QSLs from CM2s verifying his reception. Well, at least we know what a card from there looks like — and there's always the possibility that Jeeves will receive a blank pasteboard some day which we can fill out to put on the shack wall in order to fool the critics (Type A).

Hints and Kinks

(*Continued from page 66*)

mounted at the end of a thin "paddle" made from scrap Masonite. The coil of the oscillator circuit extends beyond the end of the paddle, to permit its insertion into the field of the coil of the circuit being worked on. A "push-to-operate" switch is mounted at the handle end of the paddle, so that the power, which is obtained from small external dry cells, is turned on only when a measurement is to be made. The meter, which

(*Continued on page 118*)



A handy probe-type grid-dip meter for the v.h.f. man. The tuned circuit and the acorn tube are mounted at one end of the "paddle."

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73, Bil Harrison, **W2AVA**

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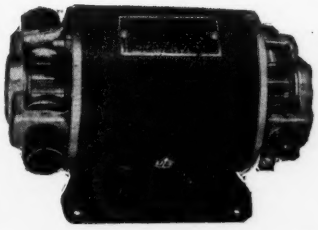

COMPACT! — only 3¾" dia., 6½" long. (This job won't take up your entire luggage compartment)
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POWERFUL! — 12 volt input gives 680 volts at 210 ma; 6 volt input gives 300 volts at 210 ma or 265 volts at 300 ma.
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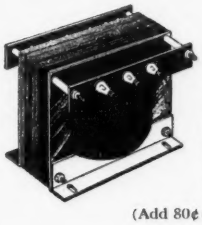

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can be a 0–1 d.c. milliampere movement, is external to the unit and is connected in the d.c. grid return through wires that are taped to the handle. The circuit is shown in Fig. 2.

A small paper scale is pasted to the front of the bracket that supports the tuning condenser, and an approximate frequency calibration is inked in.

To use the gadget to check the resonant frequency of a tuned circuit, hold it with its coil near the circuit in question and tune the dial. At the point of resonance, the grid current indicated will dip sharply.

The unit can also be used to detect the presence of v.h.f. parasitics in low-frequency gear by similar methods. Hold it with its coil near a tuned circuit in which a parasitic is suspected and tune through the condenser range. A sharp kick in grid current will be indicated when the unit is tuned to the spurious frequency.

With the layout and coil dimensions shown, this unit tuned the range between 128 and 160 Mc.

— *C. Vernon Chambers, W1JEQ*

Correspondence

(*Continued from page 67*)

mitter to warrant its being mentioned in maintenance literature. Opening of the h.v. bleeder resistor is also a source of danger. You may be assured that a new tune-up procedure is being instituted at W2RVU, at such a time as I am able to return to the air. Henceforth, the line cord will be disconnected before any operation requiring reaching inside of the transmitter is performed. As a further precaution, I intend to use a shorting rod with a long insulated handle to ground the part upon which I have to work prior to touching same.

— *Fred Seifert, W2RVU*

Quivira Lake, Kansas

Editor, *QST:*

. . . Since I am qualified by now having a long white beard, I often shudder when I think of all of the new fellows (and gals) getting tickets without realizing that actually a ham ticket is a permit to experiment with lethal machines. Consequently the new ham can purchase a miniature, but just as deadly, electric chair in the form of the component parts of a power supply. The potency is only limited by the funds in his pocket.

Frequently remarks are heard that "this power supply can't hurt you much, as it is only 300 volts." Few realize that the voltage has little to do with the situation. It depends entirely upon the resistance of the individual's body — if the resistance of the body is low enough to pass about thirty mils, the lights go out. It is the same old familiar application of Mr. Ohm's Law. You undoubtedly remember the occurrence many years ago of the lad in an Eastern experimental lab who was electrocuted by purposely breaking the skin of his wrists, rubbing salt in the wounds and connecting a 22½-volt "B" battery in series with his wrists. Even if it was a myth it could have happened.

— *Alexander Maitland, WØDEF*

Sweepstakes Results

(*Continued from page 65*)

W9NDA 414, W4YNQ 404, W8HUD 375, W7KVU 357, W6QEU 353, W2TUK 391, W6MLY 383, W9TAK 332, W9RNM 317, W9RBI 314, W4JYB 303, W6IKQ 303, W2RVC 301, W9KYM 300.

Club Participation

A gavel is offered in each SS to the radio club whose members submit the highest aggregate

(*Continued on page 120*)

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Bob Henry
W6ARA

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Hallicrafters SX43	169.50
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Hallicrafters S55	119.50
Hallicrafters S56	99.50
Hallicrafters T-54	169.50
Hallicrafters S40A	89.50
Hallicrafters S51	129.50
Hallicrafters SP44	49.50
Hallicrafters HT18	110.00
Hallicrafters HT9	350.00
Hammarlund HQ129X	189.15
Hammarlund SP400X Super Pro	450.00
National NC-33	65.95
National NC-57	89.50
National NC-173	179.50
National NC-183	269.00
National HRO-7	279.00
National NC240D	240.00
National HFS	125.00
RME HF-10-20	77.00
RME VHF-152A	86.60
RME DB22A	77.00
RME-84	98.70
RME-45	198.70
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Millen 90881	89.50
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FOR EXAMPLE:

Collins 75A-1 receiver	**$ 375.00**
Collins 32V-1	**475.00**
Collins 30K-1	**1450.00**
Collins 70E-8	**40.00**
Collins 310C-1	**85.00**
Collins 310C-2	**100.00**
Collins 210B-1	**190.00**
Collins 310B-3	**215.00**

COMPLETE STOCKS

Henry has *everything* in the ham field.

QUICK DELIVERY

Shipments *4 hours* after receipt of order. Send $5.00 with order and shipment will be made at once C.O.D.

TRADE-INS

You can't beat Bob Henry for trade-ins. Write, wire or phone today about your equipment and Bob Henry will make you a better offer than you can get anywhere else.

TIME PAYMENT

Because Bob Henry finances the terms himself you get a better break. Save time and money, deal with Bob Henry on his personal, profitable time payment plan.

Butler, Missouri

HENRY RADIO STORES

11240 Olympic Blvd.
LOS ANGELES 25
CALIF.

"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"

score. For the past seven years the Frankford Radio Club of Philadelphia has won the award. This year the award goes — yes, you guessed it — to Frankford once more! This group of top-notch operators are well on the way to realizing their avowed ambition: to win a gavel for each member of the club. Their score this year was 2,670,877, an increase of more than 800,000 points over their 1946 total. Congratulations, Frankford, on a performance that even *you* may find difficult to improve in the next SS!

The Bloomfield (N.J.) Radio Club obviously means business in the club competition. From seventeenth place in the previous contest, they pulled up to second in this one by scoring 1,438,-628 points. Potomac Valley Radio Club, a newcomer to the field, earned a well-deserved third place with their 1,149,780. A tabulation listing the standings of the 64 other clubs that entered the competition accompanies this report. Special certificate awards are being made to the leading 'phone and c.w. operators in each club that submitted three or more entries.

—•••—

The Fourteenth Sweepstakes was undoubtedly the most keenly competitive activity of its kind in ARRL contest history. It was an activity so replete with new records that one wonders if the contest experts can possibly outdo themselves next November. Time will tell. And, speaking of time, why not take advantage of the summer and early fall months to clean up that VFO signal, perfect your break-in system, improve your antennas if possible, and otherwise use your ingenuity in setting up your station for maximum operating convenience in the 1948 SS? CU in November!

SCORES

Fourteenth Sweepstakes Contest

(Scores are grouped by Divisions and Sections. . . . The operator of the stations first listed in each section is winner for that section. . . . Asterisks denote stations not entered in contest, reporting to assure that stations they worked get credit. . . . The number of stations and number of sections worked by each participant are given following the score. . . . Example of listings: W3BES 147,700–844–70, or, final score 147,700, number of stations 844, number of sections 70.

ATLANTIC DIVISION

E. Pennsylvania

W3BES	147,700–844–70
W3BXE	116,115–685–68
W3GHM	113,398–677–67
W3KT	103,360–608–68
W3AIZ	97,485–582–67
W3CPS	92,374–578–69
W3CPV	92,209–553–67
W3GYV	91,665–586–63
W3GVS	88,751–515–69
W3ISE	87,653–567–62
W3FLH	85,280–533–64
W3ARK	82,530–524–63
W3GRS	81,635–563–58
W3FUF	81,520–511–64
W3HLZ	79,592–516–62
W3HRD	79,200–480–66
W3IXN	78,750–500–63
W3EQA	70,420–437–66
W3GQW	68,167–447–61
W3EKK	68,035–440–62
W3GHD	61,070–394–62
W3MFM	57,750–462–50
W3KFA	53,530–406–53
W3JPA	48,833–383–51
W4AIH/3	37,440–288–51
W3KDF	35,092–285–62
W3ADE	32,592–291–56
W3EAN	25,870–200–52
W3ITW	22,568–217–52
W3LVF	20,425–239–43
W3JBC	19,005–181–42
W3HHS	17,500–200–35
W3ICK	14,910–143–42
W3DMQ	14,338–185–31
W3LGN	13,408–175–31
W3DFJ	12,120–152–32
W3OML	11,302–137–33
W3DZ	10,602–171–31
W3UKI	9,993–103–39
W3JKK	9,619–133–29
W3HXA	8,591–119–29
W3HCT	8,497–147–29
W3EER	7,995– 82–39
W3MQC	7,323–102–29
W3QS	5,376– 93–23
W3ENH	4,410– 63–28
W3VMF	3,637– 97–30
W3BNS	3,300– 50–33
W3GQC	2,370– 73–24
W3DTE	800– 20–16
W3NEQ	350– 14–10
W3NIT	72– 17– 6
W9BYV/3	66– 6– 6

'Phone

W3DHM	32,572–241–68
W3IEG	5,940–100–30
W3MTH	4,795– 69–28
W3BES	25– 5– 2
W3MFT	23– 10– 9

(Continued on page 122)

GENERAL ELECTRIC FM TUNER

Engineers rave about it! **Musicians acclaim it!**

FM reception reaches a new high in fidelity when this new Model XFM-1 is used in conjunction with any radio receiver or amplifier designed for phono operation.

The r-f stage of this translator is unusual in a number of respects. Variable inductance tuning is employed instead of using a conventional tuning capacitor. This design has two distinct advantages. It provides a highly efficient circuit in our range (88 to 108 mc) which would not be possible with the more conventional methods of tuning and provides drift-free frequency stability.

While they last
Harvey Special Price

$49.50

SPECIFICATIONS *These specifications prove beyond doubt that this FM tuner excels.*

CABINET:
Beautiful hand-rubbed natural walnut, 10¾" high, 11½" deep, 15¾" wide. Tuning dial is slide-rule type, wide open, with frequencies clearly marked.

ELECTRICAL RATING:
Nominal voltage, 110 at 50-60 cycles, 65 watts. Has built-in tapped transformer with selector switch for voltages: 110 (103-117); 125 (117-133); 150 (140-160); 200 (185-213); 225 (213-234); 245 (234-260).

OPERATING FREQUENCIES:
88 mc to 108 mc. 300-ohm input for folded dipole antenna. Also has built-in antenna.

TUBE COMPLEMENT:
R-F amplifier, 6AG5; Oscillator, 6AK5; Converter, 6AK5; 1st I-F amplifier, 6SG7; 2nd I-F amplifier, 6SV7; Limiter, 6SH7; Discriminator and audio amplifier, 6AQ7GT; Rectifier, 5Y3GT/G; Dial light Mazda No. 44.

The chassis has been tropicalized.

The quantity is limited and at Harvey's Special Price they won't last long. Get your order in at once to ensure delivery.

Telephone: LOngacre 3-1800

HARVEY RADIO COMPANY INC.

103 West 43rd St., New York 18, N. Y.

Prices are F.O.B. New York City and are subject to change without notice.

Md.-Del.-D. C.

W3GAU	127,800–720–71
W3FQZ	111,840–699–64
W3DPA	102,510–619–67
W3JTC	101,440–634–63
W3DRD	96,050–565–68
W3MSK	82,240–514–63
W4KXN/3	79,852–507–63
W3FPQ	75,795–490–62
W3EIS	75,473–522–58
W3BVN	71,300–436–70
W3KZQ	65,753–399–66
W3DKT	61,975–370–67
W3AEL	56,963–369–62
W3MSK	55,688–405–55
W3MTQ	52,975–411–65
W3GBB	52,613–345–61
W3EYF	51,000–375–68
W3JYS	50,245–388–52
W3HQX	44,030–309–57
W3FYS	43,276–350–62
W3LVJ	42,780–276–62
W3GZH	39,883–301–53
W3BKZ	38,346–291–66
W3HTK	37,365–282–53
W3LUL	33,360–209–64
W3FDJ	33,337–315–53
W3MCG	27,610–252–44
W3JZY	26,500–200–53
W3KZR	25,732–220–47
W3MJQ	21,890–202–44
W3ECP	17,395–142–49
W3KHU	16,700–168–50
W3MNC	15,910–218–37
W3GZF	15,580–152–41
W3FFN	15,565–142–44
W3WU	15,304–116–53
W3HMH	12,079–130–47
W3MNO	11,932–111–43
W3KYJ	9,720–108–45
W3BUB	8,636–129–34
W3FY	8,325–114–37
W3IJW	8,200–103–32
W3KMN	6,480–108–24
W3MCD	6,023– 73–33
W3IL	5,616–104–27
W3SVD	5,309– 69–31
W3LMB	5,250– 75–35
W3ISF	3,030– 51–24
W3GUS	3,000– 60–25
W3NIM	2,446– 52–19
W3NNK	1,688– 39–18
W3HBT	1,670– 33–20
W3MHW	1,500– 30–20
W3MFJ	1,470– 37–22
W3AKB	1,395– 31–18
W3NHT*	1,144– 31–15
W3JGK	829– 26–13
W3MAX	553– 17–13
W3MPR*	484– 19–13
W3JQB	8– 2– 2
'Phone	
W3FUV	31,850–245–65
W3JVI	6,090– 87–28
W3BKK	3,354– 65–26
W3HO	1,932– 42–23
W3DZZ	910– 26–14
W3HWH	608– 22–16
W3KBX	225– 12– 9

So. New Jersey

W2OXX	119,974–696–69
W2PWP	108,675–621–70
W2QCM	105,543–650–65
W2JAG	102,938–675–61
W2SAI	102,255–602–68
W2HEH	101,600–637–64
W2IMU	97,262–634–62
W2FXN	95,503–609–63
W2EXB	88,608–530–67
W2TNN	64,900–472–55
W2PIN	61,744–434–57
W2RDK	60,685–458–53
W2QCL	50,700–338–60
W3NF/2	49,733–349–57
W2TPJ	42,131–375–45
W2RPH	23,400–240–39
W2UAP	12,320–156–32
W2RXL	11,548–149–31
W2HAZ	7,315– 77–38
W2WLP	2,933– 54–23
W2BEI	2,652– 51–26
W2OSB	1,013– 27–15
W2CFB	813– 25–13
W2WAZ	805– 23–14
W2VIS	340– 17–10
W2ORS*	8– 2– 2
'Phone	
W2QKJ	6,204– 96–33
W2QKE	5,516– 50–28
W2VIS	4,590– 86–27
W2BEI	1,064– 28–19
W2PWP	108– 9– 6
W2HEH	20– 4– 2

W. New York

W2SSC	116,790–709–68
W2PGT	111,555–661–67
W2FBA	87,850–502–70
W2ADV	84,600–564–60
W2SYT	70,140–501–56
W2QHF	68,788–595–58
W2EWT	65,286–527–62
W2AW	64,800–405–64
W2WFU	58,219–403–58
W2CLO	50,480–362–56
W2KEL	36,048–376–48
W2PVL	33,345–247–54
W2ROM	27,810–258–54
W2SZK	21,636–302–36
W2OVT	20,299–192–53
W2RSV	15,000–200–30
W2PGU	13,693–261–42
W2VXA	11,770–110–44
W2BTW	9,630–107–45
W2BLO	9,450–105–36
W2ECY	6,163– 85–29
W2SJV	5,808–101–23
W2QQ	4,752– 73–33
W2FYH	4,526– 73–31
W2PH	4,004– 91–22
W2QHH*	3,488– 47–30
W2ZS	2,500– 50–20
W2VNP	2,405– 37–26
W2QMS	444– 19–12
W2DUQ*	225– 10– 9
'Phone	
W2PUN	25,410–154–66
W2PDB	5,656– 91–25
W2WKO	1,360– 34–20
W2RUK	371– 17– 9

W. Pennsylvania

W3GJY	87,425–538–65
W3BKS	49,146–346–57
W3KQD	42,795–318–54
W3KWL	36,656–316–58
W3LMM	36,612–253–58
W3NRE	32,060–229–5
W3KFD	28,004–259–43
W3BCV	27,877–230–61
W3NJH	26,832–280–48
W3LJQ	23,324–199–47
W3LFJ	20,228–261–31
W3KUY	18,480–212–44
W3GEG	18,040–205–44
W3TTN	13,440–129–42
W3UVD	12,253–169–29
W3KTW	12,200–122–50
W3LOR	10,922–127–43
W3MIZ	10,913–147–30
W3NCJ	8,400–140–30
W3YA	5,632– 91–32
W3MLG	3,988– 70–23
W3MYN	3,750– 75–20
W3RCQ	3,564– 66–27
W2RIN/3	3,185– 49–26
W3NCD	2,250– 52–18
W3NWY	1,794– 41–23
W3LHX	660– 22–12
W3NWB/3	616– 23–14
W3RWJ	140– 14– 5
W3KJM*	40– 5– 4
W3OMG	40– 4– 4
W3NAT	2– 1– 1
'Phone	
W3KQU	29,421–235–63
W3AER	27,192–206–66
W3FIH	18,360–171–54
W3MHD	17,226–150–58
W3MUF	14,254–169–42
W3OIW	11,250–125–36
W3LQX	5,320– 70–38
W3LWW	4,200– 88–24

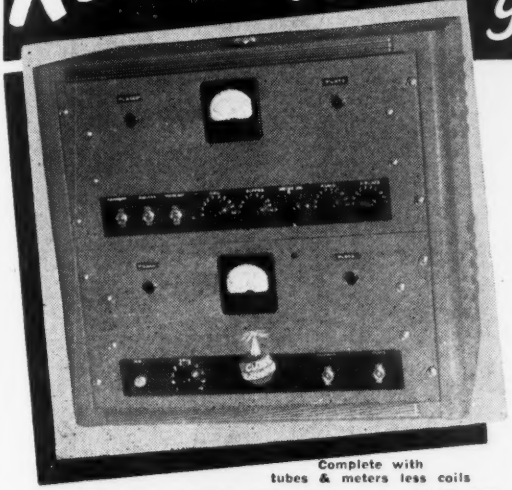
CENTRAL DIVISION

Illinois

W9FOI	138,345–862–69
W9ERU	125,960–753–67
W9FJB	114,240–817–70
W9GRV	106,250–625–68
W9VES	105,060–618–68
W9WFS	103,673–604–69
W9NII	102,680–605–68
W9WEN	98,313–607–65
W9TO	91,040–569–64
W9PNE	86,849–520–67
W9BGC	85,470–518–66
W9GFF	85,006–508–67
W9AMP	82,800–600–69
W9IML	71,874–546–66
W9YTV	65,625–439–60
W9KYX	61,380–396–62
W9AEW	60,384–443–68
W9EMN	60,060–365–66
W9IPT	58,748–373–63
W9OAT	55,553–412–54
W9VOQ	51,697–339–61
W9INN	51,381–332–62
W9TBU	48,960–308–64
W9JUO	48,580–347–56
W9OLU	44,561–350–51
W9AGM	44,033–309–57
W9TCK	43,249–357–61
W9TAL	41,325–287–58
W9LVD	38,715–267–58
W9SIV	32,370–250–65
W9FST	32,364–281–58
W9FKC	31,275–211–60
W9ADM	28,923–254–46
W9IVD	28,782–267–54
W9JUV	25,118–199–51
W9HLB	24,188–226–43
W9ZQX	23,880–200–48
W9AJJ	21,925–196–45
W9TMU	21,621–177–49
W9NJZ	21,360–178–48
W9OQZ	21,105–201–42
W9GQI	20,328–175–47
W9ZRG	19,032–183–52

(Continued on page 124)

READY NOW... WRL's NEW Globe Champion



Complete with tubes & meters less coils

Kit Form $253.25 Wired $273.25

To insure safe delivery add $7.50 for wood crate.

150 WATT XMTR KIT

Leo I. Meyerson
WØGFQ

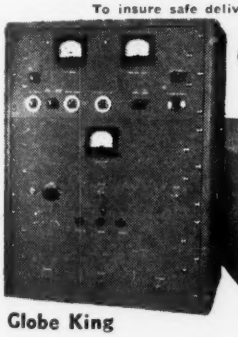
Here's the newest addition to the WORLD FAMOUS FAMILY of WRL Amateur Xmtrs. A great value based on the Dollar-per-watt ratio—150 watts input on 10, 11, 20, 40, and 80 meter bands gives this compact self contained 2 section unit plenty of "Punch" for D.X. Gray finish metal cabinet is 22" wide x 15" deep x 19½" high. Operates on 105-125 volts, 50-60 cycles AC: Maximum power consumption 550 watts.

HERE'S SOME OF THE EXTRA FEATURES . . .

- R. F. Sec. is a complete C. W. Xmtr.
- Provisions for ECO (80-40 meter Xtals covers 10-80 meter bands)
- Automatic fixed bias on Final and Buffer stages.
- Meter switching on all stages.
- Voltage regulators on osc. and buffer stage.
- Class B Modulator will modulate 150W R. F.
- RF & Modulator sec. can be purchased separately.
- Standard parts—Thord, U. T. C., Stancor, B&W.

Write for prices on individual sections. Complete detailed description sent promptly at your request. Use Leo's easy time payment plan and remember you get bigger trade-in prices at WRL. All inquiries gladly answered same day.

World Famous WRL Xmtrs...



Globe King

Globe Trotter

WRL Exciter Kit

UNCONDITIONALLY GUARANTEED!

275 WATT GLOBE KING gives efficient performance on 6-10-20-40-80 meter bands phone & C. W. You get more watts-per-dollar, write for complete description.

WRL GLOBE TROTTER It's a 40 watt input kit complete with all parts—ready to go—just ask the amateur who has one.

WRL EXCITER KIT—See May Q. S. T. and write for descriptive information.

WRL Globe King XMTR Kit
Kit.....$366.45 Wired.....$386.45

WRL Globe Trotter XMTR Kit
Less Tubes..$69.95 Wired..$79.50

WRL Exciter Kit
Less Accessories $19.95 Wired $25.95

Try Leo's Personalized Payment Plan—It's Easy—20% Down—Payments To Fit Your Budget

Get Acquainted Offer

New up-to-date giant radio reference map—just right for your control room wall. Approximately 28"x42". Contains time zones, amateur zones, leading shortwave stations, monitoring stations.

MAIL COUPON TODAY AND **25c**

Now You Can Afford Crystal Control

Here's the Biggest Crystal Value ever offered. Please specify when ordering, phone or CW bands. We can't guarantee exact frequencies, but we will come close as possible to frequency desired. Low temperature coefficient cut-frequency versus temperature change less than 2 cycles per meg-cycle per degree centigrade. Calibration accurate within 01%. Ft 243 holder.

80 meter—3.5 mc to 4.0 mc.....69c 40 meter—7.0 mc to 7.4 mc..69c
20 meter—14.0 mc. to 14.3 mc. $1.19

Reg. $2.75 Value Only **69¢**

MORE SMASH VALUES .

75TL tubes	$2.49	OIL FILLED SQ. CAN TYPE CONDENSERS	
807 tube	1.35	1 mfd. 1500V	$ .49
805 tube	4.95	4 mfd. 1500V	1.59
24G tube	.59	BC-458A only a few left	5.95

Get this 68 Page Bargain Catalogue FREE!

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744 West Broadway
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Please send me: ☐ Globe Champion Data
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☐ Parts Catalogue ☐ Globe Trotter Data

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Address .....

City.. .. ..Zone.... State.....

World Radio LABORATORIES INCORPORATED
EVERYTHING IN RADIO
COUNCIL BLUFFS, IOWA

W9FIN	18,528–193–48	
W9FLH	18,412–152–49	
W9BPU	18,050–143–50	
W9EMJ	16,728–204–41	
W9OUR	16,125–150–43	
W9ECD	15,480–174–45	
W8YIN/9	14,761–122–49	
W9EDH	14,742–176–42	
W9VFZ	14,560–104–70	
W9ZST	14,560–182–40	
W9ANY	13,650–131–42	
W9ZOQ	12,920–136–38	
W9LM	12,195–136–45	
W9KPT	11,020–152–29	
W9VPD	10,579–108–39	
W9JHH	10,424–136–31	
W9FQ	9,200– 92–40	
W9EBX	9,040–113–40	
W2BTQ/9	8,342– 97–43	
W9KXD	8,163– 75–43	
W9EHX	7,789–101–31	
W9FKI*	7,600– 76–40	
W9NGG	7,118–110–26	
W9TNQ	4,640– 64–29	
W9KWW	4,514– 80–23	
W9IBC	4,500– 60–30	
W9AYH	4,253– 64–27	
W9ZGG	4,125– 55–30	
W9EOL	3,315– 51–26	
W9MMH	3,105– 46–27	
W9CMC	2,755– 48–29	
W9JSL*	2,501– 44–23	
W9SYZ	2,300– 50–23	
W9APE	1,633– 36–23	
W9EZF	1,254– 33–19	
W9AA	1,200– 30–20	
W9LP	544– 23–14	
W9NMY	540– 24–12	
W9CEO	468– 20–12	
W9FFD	234– 13– 9	
W9QFF*	224– 14– 8	
W9FKV*	219– 14– 7	
W9ECJ*	210– 14– 6	
W9QCQ	147– 12– 7	
W9OEO	96– 8– 6	
W9UBW	2– 1– 1	
'Phone		
W9NDA	57,820–414–70	
W9TAK	45,816–332–69	
W9RNM	43,112–317–68	
W9KLV	10,810– 92–47	
W9CWP	9,546–131–37	
W9BDV	6,972– 84–42	
W9GQB	5,400– 80–27	
W9IFA	5,226– 66–39	
W9IIT	4,070– 55–37	
W9FVU	3,038– 46–27	
W9KVD	1,840– 40–23	
W9CMC	1,248– 39–16	
W9VH	850– 27–17	
W9ZYL	850– 25–17	
W9LXD	560– 29–16	
W9VFZ	448– 16–14	
W9RBY	442– 18–13	
W9ZQX	385– 15–11	
W9WXT*	126– 9– 7	
W9OLU	3– 1– 1	
Indiana		
W9IU	118,655–698–68	
W9CYU	108,800–641–68	
W9DUY	103,155–599–69	
W9NH	55,935–339–66	
W9VDB	54,416–346–43	
W9CIC	44,478–355–63	
W9HUV	29,315–226–65	
W9EGQ	26,250–210–50	
W9BQE	24,780–211–59	
W9DGA	14,080–128–44	
W9QLW	12,060–134–45	
W9CNG	11,550–105–44	
W9IOH/9	3,213– 60–21	
W9YDP	2,618– 56–19	
W9GFS	1,852– 39–19	
W9SFR	1,350– 30–18	
W9UKT*	9– 3– 3	
W9NXM*	28– 4– 4	
'Phone		
W9KYM	40,732–300–68	
W9UUN	21,122–179–59	
W9FOO	9,120– 91–51	
W9CLF	8,136–113–36	
W9BKJ	5,580– 93–30	
W9DCM	4,110– 60–34	
W9UTL	1,608– 34–24	
W9WCE	546– 21–13	
W9NXM	460– 24–10	
W9FJI*	250– 15– 8	
Wisconsin		
W9RQM	141,795–826–69	
W9VSO	123,752–625–66	
W9LVR	96,475–573–68	
W9CRX	84,160–531–64	
W9BVG	82,176–645–64	
W9UIT	80,240–503–64	
W9LZU	51,040–352–58	
W9KXK	46,208–303–61	
W9STE	44,025–300–60	
W9DKH	42,560–380–56	
W9JBF	40,012–292–55	
W9HVM	35,980–257–56	
W9KKX	24,900–250–50	
W9IDU	23,744–212–56	
W9RKP	22,80000–2–57	
W9FZC	18,013–131–55	
W9GQO	17,390–149–47	
W9MDG	11,330–103–44	
W9OXP	11,146–125–37	
W9YMG	8,360– 88–38	
W9IQW	7,660– 81–38	
W9WXD	7,323–102–29	
W9RH	5,680– 71–40	
W9EIZ	3,710– 53–28	
W9LFK	3,262– 90–29	
W9SIZ	3,163– 58–22	
W9DR	935– 34–11	
W9DND	750– 25–15	
W9RLB	720– 24–15	
W9RRA	700– 21–14	
W9CFP	675– 23–12	
W9LED	577– 21–11	
W9ILR*	68– 9– 3	
W9UJM	60– 6– 5	
'Phone		
W9RBI	54,950–314–70	
W9QIX	32,886–263–63	
W9PTN	16,002–127–63	
W9PTE	13,920–120–58	
W9ESJ	4,624– 68–34	
W9CJO	3,525– 71–20	
W9NVJ	3,115– 45–28	
W9FHU	2,964– 57–26	
W9HEE	1,932– 42–23	
W9VHA	225– 10– 9	
W9QJW	60– 6– 4	
W9LUC*	32– 4– 4	

DAKOTA DIVISION

North Dakota		
WØHKM	66,930–389–69	
WØLHS	6,320– 80–40	
WØSWC	1,811– 35–21	
WØBJG*	1,215– 28–18	
'Phone		
WØGZD	35,100–234–60	
WØWFO	5,005– 72–35	
WØEGC	4,736– 74–32	
South Dakota		
WØYEZ	67,419–404–67	
WØWUU	29,610–212–56	
WØPHR	28,768–251–58	
WØGCW	23,527–181–52	
WØFOQ	19,695–152–52	
WØYJO	19,116–156–49	
WØUVL	11,609–126–47	
WØNCV*	11,088–126–44	
WØBLK	5,920– 80–37	
WØSUJ	1,864– 36–21	
WØOPS	403– 16–13	
WØQVY	72– 6– 6	
'Phone		
WØIWE	16,748–160–42	
WØKQO	9,158–100–37	
WØVT	8,354– 83–41	
WØQHX	7,120– 90–32	
WØYOB	4,959– 87–29	
WØGLA	4,713– 65–29	
WØYKY	1,148– 26–18	
Minnesota		
WØYCR	107,669–810–67	
WØJNC	106,930–631–68	
WØMBY	71,920–464–62	
WØGHN	50,706–334–61	
WØEPJ	32,725–238–55	
WØVIP	30,366–241–63	
WØKPQ	29,135–201–58	
WØDIE	19,028–179–43	
WØFAH	16,856–196–43	
WØDUS	13,412–140–48	
WØDNY	11,500–100–46	
WØPIG	8,288– 95–34	
WØWUQ	4,842– 76–26	
WØKYE	3,480– 58–24	
WØVJH	3,125– 50–25	
WØOOF*	2,688– 48–28	
'Phone		
WØOWK	27,840–232–60	
WØCBM	23,546–193–61	
WØRVS	8,000–100–32	
WØSZC	7,343– 89–33	
WØEPJ	520– 16–13	

DELTA DIVISION

Arkansas		
W5LUY	72,270–438–66	
W5JIC	44,713–369–61	
W5LLU	26,880–194–48	
W5DRW	38,192–313–62	
W5FMF	4,455– 54–33	
W5HDR*	3,444– 63–28	
W5BQA	1,063– 25–17	
W5EGX*	98– 7– 7	
W5LZQ	10– 2– 2	
'Phone		
W5LRE	28,490–204–70	
W5FPD	15,000–150–50	
Louisiana		
W5KC	114,540–665–69	
W5USN	77,694–568–69	
W5BUK	51,460–417–62	
W5BI	20,520–171–48	

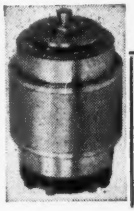
(*Continued on page 126*)

Starting Our LEEDS 26th Year

The Home of RADIO

JUST ARRIVED

SELSYN MOTORS



115 Volt AC 60 Cycle. Can be used to turn small beam antennas, or as indicators only. Special, per pair.....**$5.95**

150 Watt H & H Rheostat, wire wound, 5 Ohms at 5.48 Amps. A Real Buy at..**$1.95**

Heinemann Magnetic type circuit breaker, 5 Amps. Special.....**95c**

Filament Transformer; 2.5 Volts at 5 Amps. 7500 Rms. Brand New.....**$2.10**

Filament Transformer; 2.5 Volts at 10 Amps. 7500 Rms. Brand New.....**$2.65**

DYNAMOTOR—5047-D.C.

Input 27 volts @ 1.75 amps. Output 285 volts @ 0.75 amps. continuous duty rating. Brand New..... **95c**

DM—43A DYNAMOTOR

Manufactured by G.E. New. Input 24 V @ 23 amps. 7500 RPM; output 515/1030/2/8 V. @ 215/260 milliamps; filtered. Special..... **$2.95**

WIRE WOUND POTENTIOMETER

100,000 ohm, precision made. G.R. type, 25 watt, 6" diameter. Brand new..... **$1.95**

BEST BUY OF THE MONTH

Sprague Radio Line Filter, 115 Volt 10 Amp; Brand New. Regular $9.75 List, For Only..... **75c**

WIRE

No. 10, Copper Enamel, 100 Ft. Lengths. Each.....**$1.75**
No. 12, Copper Enamel, 100 Ft. Lengths. Each.....**$1.25**
No. 14, Copper Enamel, 100 Ft. Lengths. Each.....**83c**
300 Ohm, Twin Lead Plastic covered, per 100 Ft....**$2.95**
RG-59U, 72 Ohm Coaxial Cable.
7c per Ft., per 100 Ft. **$6.75**

OIL FILLED CONDENSERS

5 Mfd., 220VAC, Motor starting condenser.....**50c**
2 Mfd., 600VDC, C.D.....**35c**
7 Mfd., 330VAC, G.E.....**98c**
10 Mfd., 600VDC, Capacitron.....**98c**
0.1 Mfd., 7500VDC, G.E.....**$1.50**
2 x 0.1 Mfd., 7000VDC, G.E.....**$2.00**
1 Mfd., 5000VDC, Solar.....**$2.95**
16 Mfd., 400VDC, W.E. Co.....**98c**
2 Mfd., 10,000VDC, C.D.....**$13.95**

5BP1, CR Tubes 5" Green Screen, Brand New, for Only.**$1.45**
3C24, Triode, 100 Watt Power Output. Brand New.
39c Each. 10 for $3.50
832A, Dual Beam Power Tetrode, New.....**$2.15**
3BP1, CR Tubes 3" Green Screen, Brand New.....**$1.45**

NATIONAL COMPANY COMPONENTS
R.F. CHOKES

Type R-100 in 2.5, 5, 10 Millihenry sizes Rated at 125 Ma. Each.....**35c**
Type R-300 in 0.5, 1.0, 2.5, 5.0 Millihenry sizes Rated at 300 Ma. Each.....**35c**
Type R-152, 4 M.H., 10 ohms. At 600 Ma. Each..**$1.75**
Type R-154, 1 M.H., 6 Ohms. At 600 Ma. Each....**$1.75**
Type R-175, 225 Micro Henries, 6 Ohms. At 800 Ma 12,500 Volt Breakdown. Each.....**$2.09**
Type R-33 1, 10, 50, 100, 750 M. H. at 33 Ma. Each..**35c**
Type R-50 in 0.5, 1, 2.5, 10 M. H. at 50 Ma. Each....**35c**

METERS

0-100 Ma. 2" Round, McClintock.....**$1.95**
0-1 Amp. RF 2" Round, G.E.....**$2.45**
100 Amp.—6 volt D.C. 3-inch scale, 4½-inch square, gray finish, with 100 Amp. Shunt.....**$2.95**
5-0-5 Amps. D.C. Charge and Discharge 2" Round....**69c**

POWERSTAT VARIABLE TRANSFORMERS

Type 20: 115 V. input, 0–135 V. output @ 3.0 amps. 0.4 KVA.....**$12.50**
Type 116: mounted; 115 V. input, 0–135 V. output @ 7.5 amps 1.0 KVA.....**$23.00**
Type 116U: unmounted; 115 V. input, 0–135 V. output @ 7.5 amps 1.0 KVA.....**$19.00**
Type 1126: 115 V. inpput, 0–135 V. output @ 15.0 amps 2.0 KVA.....**$46.00**
Type 1226: 230 V. input, tapped at 115 V., 0–270 V. output @ 9.0 amps 2.4 KVA.....**$46.00**
Type 1156: 115 V. input, 0–135 V. output @ 45.0 amps 6.1 KVA.....**$118.00**

SILVERSTAT

Ideal for use as voltage regulator, leaf type, similar in function to carbon pyle, continuously variable. Resistance 10–1200 ohms. When used in bridge circuit ideal to control Servo motor..... **$1.95**

ITEMS YOU MAY BE LOOKING FOR!

Selsyn Generator 90 V.A.C. input 60 cycle. Brand New. Each.....**$2.50**
Choke; 18 henries at 100 ma.....**$1.25**
110 Volt 1 inch Bull's Eye with dimmer—red.....**39c**
Neon Testers—90–550 Volts.....**19c**
Shielded Phone plugs.....**30c**
ARC-5 Banana plugs silver plated. Per doz.....**10c**
De Jur Wire Wound Pots 12 Watt 20,000 Ohm.....**49c**
RS-8, Low Loss, Octal Sockets.....**08c**
8AG 1/100 Amp. Fuses. Doz.....**50c**
PL-259 Plugs, silver plated.....**19c** Each. Per 100 **$15.00**

VARIABLE CONDENSERS

6 Gang Variable Condenser; 1 section 250 mmfd, 4 sections .000035 mmfd; 1 section .00005 mmfd with 5 Air Trimmers 15 to 25 mmfd all Silver Plated. Only.....**95c**
APC-25 Air Trimmers, Screw Driver Adjust. Silver Plated.
15c Each. 10 for **$1.25**
APC-50 Air Trimmers, Screw Driver Adjust. Silver Plated.
15c Each. 10 for **$1.25**

RELAYS

G.E.; 2500 Ohm, 4 Ma SPDT, 5 prong plug in type, hermetically sealed. Brand New..... **.95c**
Multiple contact, telephone type relays high resistance. Extra special..... **.49c**

CS—DIFFERENTIAL RELAY

Dual coil with armature pivoted between calls. All contacts normally open. Operates 220–250 Volts. 8000 Ohms each coil, contacts S.P.D.T. Controls rated 2 amps. at 110 VAC. Ideally suited for balanced or bridge type circuits where limited current or power is available. Will withstand 12 G Vibration up to 60 cycles at 35,000 feet altitude.
Special low price..... **95c**

If not rated 25% with order, balance C. O. D. All prices F. O. B. our warehouse New York. No order under $2.00. We ship to any part of the globe.

LEEDS RADIO CO.

75 Vesey Street
COrtlandt 7-2612

Dept. Q56
New York City 7

W5NRR	19,080–160–48	
W5RX	15,666–121–52	
W5FYS	4,608– 73–32	
W5HOU	2,184– 43–26	
'Phone		
W5GHF	13,268–123–58	
W5LDH	6,449– 96–39	
W5FMO	6,020– 86–35	
Mississippi		
W5LAR	75,600–480–63	
W5BK	62,937–503–63	
W5WZ	29,760–248–60	
W5FGE	21,168–238–54	
'Phone		
W5IHP	12,296–116–53	
W5LPG	3,813– 62–25	
Tennessee		
W4BAQ	63,538–393–65	
W4ERN	63,181–477–67	
W4HOJ	59,590–378–59	
W4KH	54,300–455–60	
W4IQY	49,158–372–53	
W4JJD	43,717–302–58	
W4IIY	27,981–204–55	
W4CVM	15,958–133–51	
W4FLW	12,900–130–50	
W4GX	11,840–128–37	
W4BOR	10,868–104–42	
W4BQW*	9,806–116–35	
W4MRD	7,863– 93–34	
'Phone		
W4AQR	32,160–240–67	
W4FIS	29,440–234–64	
W4TWI	9,824–154–32	
W4JMZ*	308– 14–11	

GREAT LAKES DIVISION

Kentucky		
W4KVX	131,655–786–67	
W4ZWR	69,120–432–64	
W4FBJ	63,800–440–58	
W4OMW	23,435–218–43	
W4UXH	10,000–100–40	
W9BPS/4	2,175– 45–20	
W4FQQ	1,628– 37–22	
'Phone		
W4YNQ	54,805–404–68	
W4JNU	5,217– 72–36	
W4JYS	630– 21–12	
W4JBW*	630– 21–12	
W4IYH	416– 16–13	
Michigan		
W8SCW	75,518–620–61	
W8RRP	75,442–564–67	
W8URM	63,865–448–57	
W8GQB	55,692–444–63	
W8GP	47,857–356–54	
W8YDR	42,627–289–59	
W8FJL	42,250–261–65	
W8SAY	41,640–347–60	
W8TRN	41,536–354–59	
W8ARJ	41,250–300–55	
W8ONK	32,302–219–59	
W8FXB	31,238–256–49	
W8UAS	28,620–212–54	
W8UQR	24,200–220–44	
W8UNK	22,771–204–45	
W8GSJ	20,570–187–44	
W8BIU	19,584–150–53	
W8CHJ	18,018–234–39	
W8HP	15,610–137–57	
W8IXJ	14,550–194–30	
W8IJE	12,444–183–34	
W8SWA	10,950–146–30	
W8DM	10,260–114–36	
W8YY	5,928– 81–39	
W8ZSN/8	5,546– 82–29	
W8YFQ	5,063– 83–25	
W8FX	4,313– 75–23	
W8MGQ	3,792– 79–24	
W8UWO	3,634– 79–19	
W8EGI	3,190– 58–22	
W8CDQ	3,098– 60–21	
W8VZZ	3,060– 51–24	
W8AIB	2,750– 55–20	
W8WDV	2,575– 52–25	
W8WOV	2,400– 50–24	
W8CLL	2,200– 50–22	
W8BMF	1,853– 39–19	
W8VMC	1,700– 49–14	
W8ZHO	1,452– 66–22	
W8LSF	1,190– 28–17	
W8YCT	1,188– 25–19	
W8BGY	1,120– 35–16	
W8ZBU	858– 25–14	
W8NHF	780– 26–12	
W8BEP*	680– 17–16	
W8DPE	680– 20–17	
W8RYP	660– 22–12	
W8SLW	591– 22–11	
W8BBK	520– 20–13	
W8QQK	475– 19–10	
W8WVL*	350– 20– 7	
W8TRP	263– 15– 7	
W8WYP*	75– 6– 5	
W8WFA	56– 7– 4	
W8ZHB*	15– 3– 2	
W8UUD*	8– 2– 2	
W8ZLH*	3– 1– 1	
'Phone		
W8HUD	52,966–375–71	
W8PYP	23,026–200–58	
W8NOH	21,932–162–55	
W8SLW	1,305– 31–18	
W8QBR	1,134– 27–21	
W8YMO	144– 9– 8	
Ohio		
W8WZ	130,288–747–70	
W9TWC/8	129,720–752–69	
W8ROX	116,025–720–65	
W8UWM	111,178–667–68	
W8PNY	87,938–528–67	
W8UJ	80,270–532–68	
W8OYI	77,282–454–68	
W8BWC	75,425–434–70	
W8PBU	74,025–470–63	
W8ZJM	71,600–449–64	
W8UZJ	68,827–492–57	
W8VTF	68,400–457–60	
W8NZI	66,938–425–63	
W8LFE	65,000–500–65	
W8TKS	62,152–461–68	
W8YPT	58,789–389–61	
W8DAE	54,739–411–67	
W8SUZ	54,060–409–53	
W8EIU	51,940–425–49	
W8UPB	49,088–428–59	
W8LOF	48,000–300–64	
W8RAA	44,225–290–61	
W8ZAP	41,063–330–50	
W8WE	40,382–331–61	
W8OUR	37,194–271–55	
W8UZF	35,187–282–50	
W8EBJ	34,200–300–57	
W8TAQ	32,450–230–59	
W8TAJ	30,895–242–49	
W8QV	29,950–302–50	
W8PCS	27,272–246–56	
W8AL	25,803–213–61	
W8UMR	22,663–185–49	
W8YJE	24,970–229–44	
W8EXI	21,840–336–65	
W8ZCD	20,680–257–40	
W8DQC	19,712–176–56	
W8TYX	18,670–172–44	
W8YGR	18,600–155–48	
W8PBX	18,407–201–37	
W8NMR	17,580–149–46	
W8ZNQ	15,910–149–43	
W8WAB	13,519–155–35	
W8AZU	12,880–140–46	
W8PYX	10,760–140–40	
W8RFA	10,633–110–49	
W8NPF	10,631– 95–45	
W8UNA	10,140–104–39	
W8REY	10,046– 86–47	
W8ZOD	9,400–119–32	
W8BUM	8,939– 81–38	
W8HFE	8,200–100–41	
W8TNB	7,711–100–31	
W8VQI	5,135– 79–26	
W8ZFK	4,244– 73–29	
W8KJK	3,188– 51–25	
W8DWP	1,813– 30–25	
W8VDF	1,040– 26–16	
W8WWU	720– 20–18	
W8ODZ	660– 22–12	
W8BCJ	420– 15–14	
W8EKK*	192– 12– 8	
W8THJ	154– 11– 7	
'Phone		
W8TRX	32,488–263–62	
W8SDD	31,626–251–63	
W8BKP	31,240–221–71	
W8PXP	30,132–243–62	
W8NCV	15,950–140–58	
W8MQG	11,832–116–51	
W8RJD	11,340–105–54	
W8KUW	9,180–103–45	
W8SRF	7,247–112–26	
W8NDN	7,176– 77–46	
W8ATK	2,530– 55–23	
W8JJM	2,496– 39–32	
W8ELB	2,376– 44–27	
W8QBF	1,568– 33–19	
W8PNJ	1,184– 37–16	
W8EQN*	1,064– 38–14	
W8TYM	828– 23–18	
W8BDA	650– 20–13	
W8QQ	158– 9– 7	

HUDSON DIVISION

E. New York		
W2EQD	85,560–620–69	
W2WKG	54,660–456–60	
W2DIJ	47,212–408–58	
W2KNR	37,950–330–46	
W2NRW	31,875–250–51	
W2PFM	21,420–211–51	
W2KPI	18,400–201–46	
W2KZX	11,625–150–31	
W2IXK	5,100– 60–24	
W2NRD	630– 21–12	
W2LH	160– 8– 8	
W2VKQ*	50– 5– 5	
'Phone		
W2NSD	57,052–421–68	
W2BDB	27,960–235–48	
W2SZ	17,172–164–53	

(Continued on page 128)

CRYSTALS

In the greatest purchase of radio transmitting crystals ever made by one wholesaler in the history of the Radio Parts Industry, Sun Radio acquired title to over a half million dollars ($500,000.00) of Army Surplus, precision built, exactly tooled crystals in moisture proof holders which are shock mounted. Please note that crystal shipments of 6 or less are packed in cloth containers to expedite handling. . . . No worry because all crystals are shock mounted and guaranteed delivered perfect. All crystals have Army MC harmonic ratings but Sun encloses directions for deriving the correct fundamental frequency in kilocycles.

CRYSTALS WITH A MILLION USES

Fractions Omitted

kc	kc	kc	kc	kc	kc	kc	kc	kc	kc	kc	kc
412	420	429	437	445	462	469	479	490	497	506	516
413	422	430	438	446	463	470	481	491	498	507	518
414	423	431	440	447	466	472	483	492	501	508	519
415	424	433	441	448	468	473	484	493	502	509	522
416	425	434	442	451		474	485	494	503	511	523
418	426	435	443	453		475	487	495	504	512	
419	427	436	444			477	488	496	505	515	

49¢ each

I.F. Frequency Standards

kc	kc	kc
450	454.166	461.111
451.388	455.556	464.815
452.777	459.259	465.277

99¢ each

Crystal Frequency Standards
98.356kc

Easily altered for 100 kc Standard. Mounted in low loss 3 prong holder.

$3.89 each

For Crystal Controlled Signal Generators
525kc

526.388	531.944	536.111
527.777	533.333	537.500
529.166	534.722	538.888
530.555		

99¢ each

ASSORTED MISCELLANEOUS CRYSTALS
Fractions Omitted

370kc	376kc	381kc	384kc	387kc
372	377	383	386	388
374	379			
375	380			

39¢ each

priced at a fraction of the cost of their holders alone.

FOR HAM AND GENERAL USE
Fractions Omitted

390kc	395kc	402kc	405kc	408kc
391	396	403	406	409
392	397	404	407	411
393	398			
394	401			

79¢ each

- Payments must accompany order. Enclose 20¢ for postage and handling. Minimum order — $2.00 plus postage.
- Crystals are shipped packed in cloth bags inasmuch as they are shock mounted. All shipments guaranteed.

"Hot Radio Values" AT SUN RADIO

CRYSTALS FOR SCR 522

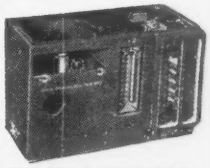
5910kc	7350
6370	7480
6450	7580
6610	7810
	7930

$1.29 each

Crystals from BC 610
¾" Spacing—2 Banana Plugs

2045	2258	2360	2532	3322
2105	2260	2390	2545	3510
2125	2282	2415	2557	3520
2145	2300	2430	3202	3550
2155	2305	2435	3215	3570
2220	2320	2442	3237	3580
			3250	3945
				3955
				3995

$1.29 each



FM TRANSMITTER BC-684

These units are BRAND NEW, providing 35-watt output, 10 channel push button crystal control employing NON-LINEAR MODULATING COIL. This unit tunes from 27 to 38.9 mc. These units come complete with tubes less power supply, covers, and crystals. Excellent 10 meter FM transmitter for "Ham" or Police use..... **$24.95**

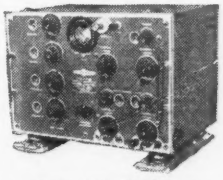
SCR-522 VHF TRANSCEIVER

Tunes 100–156 MC. Don't confuse these with other incomplete and abused 522s. Sun Radio offers electronically perfect and guaranteed 522s . . . AND COMPLETE with tubes, remote control box, 28 volt dynamotor (can be converted to 110 V operation), 4 crystals and ALL CABLE CONNECTORS but less cable..... **$24.95**

100 WATT

BENDIX TRANSMITTER

4 separate E.C.O.



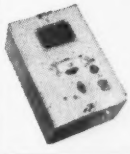
These can be easily converted to 20–40–80 meters. Crystal required for 10 meters. Each electronic coupled oscillator dial has 3000 divisions enabling quick precision shifting. This transmitter was constructed of the highest quality of precision parts, with laboratory precision. Four separate output tanks; one 4-position selector channel switch having seven sections which changes the ECO, IPA and output tanks simultaneously.—BRAND NEW, complete with tubes..... **$49.95**

WALKIE TALKIE

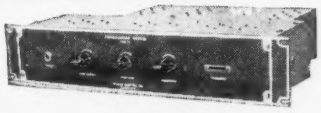
Set $129.90

SCR195 Walkie Talkies' brand new, weight 27½ pounds including knapsack. 52.8 to 65.8 MC. Complete with spare parts. Each..... **$69.95**

V.H.F. TRANSMITTER



Here is one of the greatest offerings in war surplus! Hundreds sold at $20 and now closed out at an amazingly low price. Brand new. Battery operated (67½ v B and 1½ v A). Frequency 80 to 105 mc. Complete with 2—1 G4 tubes and full instruction manual. Ready to go on the air. Less batteries..... **$6.95**



110 VOLT

SUPERHETERODYNE RECEIVER

This Crystal fixed frequency receiver comes with full conversion instructions for variable tuning of all ham bands and broadcasts. A highly selective superhet receiver, 110 V A.C. power supply, built-in. Uses the following tubes:

6K7—R.F. Amplifier, 6K8—dual purpose mixer and oscillator, 6K7—I.F. Amplifier, 6C8—detector, 6C8—Output, 6SN7—B.F.O., 80—Rectifier. Dimensions—3½ x 19 x 11½ inches. Comes complete, brand new, with one set of coils and two sets of tubes..... **$16.95**

ANTENNAS

(A) Small four-section telescopic aerial ideal for portable receivers, transceivers or test equipment.

99¢

(B) 22" tapered high frequency aerial covering 150 to 200 MC. Ideal for mobile or fixed station use.

$2.69

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All Brand New and Guaranteed

GE 2" Round	0–500 D.C.-M.A....	2.97
Simpson 2" Round	0–15 D.C.-V.....	2.97
Triplett 2" Square	0–40 D.C.-V.....	2.97
Sun 2" Round	0–300 D.C.-V.....	2.97
GE 3" Square	0–150 A.C.-V.....	3.49

• TERMS: All items F.O.B., Washington, D. C. All orders $30.00 or less, cash with order. Above $30.00, 25 per cent with order, balance C.O.D. Foreign orders cash with orders, plus exchange.

SUN RADIO

OF WASHINGTON, D. C.

938 F STREET, N. W. WASH. 4, D. C.

W1HJP/2	5,082– 77–33
W2CFY	2,464– 43–28
W2WQU*	8– 2– 2
N. Y. C. & L. I.	
W2IOP	156,555–882–71
W2AYJ	108,150–618–70
W2PZE/2	82,045–541–61
W2HMJ	77,824–608–64
W2KIR	63,619–398–65
W2NCG	61,360–416–59
W2TYU	59,400–550–54
W2GTL	51,544–380–68
W2WC	50,050–308–65
W2KPA	47,294–402–47
W2GXC	47,256–358–55
W2DXL	45,220–323–56
W2MDM	41,328–370–56
W2LRI	40,837–371–45
W2GP	40,375–323–50
W2AOD	37,875–303–50
W2QBS	37,778–329–46
W2IFA	36,066–240–61
W2QYZ	35,465–346–41
W2ORZ	35,046–266–66
W2JBP	34,650–276–63
W2AWF	33,960–283–60
W2OWX	33,003–308–43
W2ZV	32,850–219–60
W2LPJ	32,430–276–47
W2KJO	31,752–262–63
W2KKR	31,500–350–45
W2PLR	24,320–153–64
W2HAQ	23,718–203–59
W2OTC	22,232–201–56
W2NWK	20,553–202–51
W2MJO	19,516–238–41
W2LQP	19,440–180–36
W2OBU	19,393–226–43
W4LOM/2	19,378–170–46
W2AJI	19,344–204–48
W2UGV	18,840–246–32
W2JBQ	18,474–443–33
W2CZF*	16,640–160–52
W2GGN	15,557–166–47
W2OUT	13,756–181–38
W2MOU	13,497–205–33
W1FET/2	11,691–101–47
W2HAY	11,400–120–38
W2UAL	11,250–150–30
W2CUQ	9,600– 96–50
W2BGO	9,440–118–32
KV4AF/2	8,100–163–20
W2PRE	7,483– 74–41
W2BO	7,400–100–37
W2OBY	6,588–122–27
W2KVL	6,468–100–26
W2DBI	5,735– 62–37
W2WGZ	5,355– 77–28
W2KTF	5,340– 89–30
W2LGS/2	5,066– 97–21
W2KVY	3,586– 76–19
W2IWP	3,045– 42–29
W2CBS	2,176– 68–16
W2AWH	2,160– 36–24
W2ETT	2,047– 39–21
W2MZB	1,485– 33–18
W2ETL	1,094– 35–25
W2LGK	825– 28–12
W2IHE	564– 24–12
W2HBO	475– 19–10
W2NQR	144– 9– 8
W2RUK	10– 2– 2
W2RTZ*	8– 2– 2
W2PWJ*	2– 1– 1
'Phone	
W2TUK	40,078–391–41
W2EGG	35,979–271–67
W2LHQ	21,560–180–56
W2BWC	17,496–163–54
W2SKE	8,405–103–41
W2NNB	1,700– 34–20
W2KZE	1,050– 30–14
W2VOU*	1,050– 35–15
W2MBU	472– 59– 4
W2NHH	413– 15–11
W2IAW	290– 15–10
W2RQJ*	2– 1– 1
No. New Jersey	
W2BXA	115,575–674–69
W2CZO	107,640–626–69
W2CWE	93,537–537–70
W2ENZ	85,255–600–59
W2GFG	80,640–512–63
W2ANG	80,080–616–65
W2LTP	79,902–586–69
W2LJR	78,708–370–66
W2BBK	78,325–603–65
W2TNA	66,836–540–62
W2CWK	64,488–470–55
W2TSL	61,640–460–67
W2EQS	57,890–418–56
W2NBL	56,654–401–61
W2DRV	50,188–402–50
W2JIB	49,560–336–59
W2HZY	48,760–314–62
W2OST	48,594–342–57
W2LFR	44,444–274–65
W2DMJ	43,691–287–61
W2FAA	43,223–340–51
W2BHM	42,496–335–64
W2GBY	42,456–349–61
W2KHT	40,976–335–49
W2OOC	39,312–313–63
W2ABL	36,978–260–57
W2SVX	36,190–342–44
W2BTG	35,713–304–59
W2DQH	32,832–259–64
W2BLS	31,110–254–61
W2TUD	30,840–257–60
W2DEN	29,078–247–47
W2OAE	27,625–224–50
W2JHE	26,982–250–43
W2JME	25,172–203–62
W2OMS	23,664–207–58
W2NIY	23,418–247–38
W2TZX	23,200–160–58
W2RYN	22,860–254–36
W2OHN	22,605–207–44
W2CQB	20,518–236–35
W2AQG	18,383–201–38
W2VPI	17,515–226–31
W2BNU	16,236–198–41
W2LMO	16,080–201–32
W2DZA	14,700–148–50
W2PGX	14,202–150–38
W2ITD	12,926–142–46
W3AOO/2	12,210–111–44
W2MDP	11,701–127–37
W2GNW	10,044–167–31
W2OCC	8,625–150–23
W2DCP	8,500–100–34
W2CO	8,100–120–27
W2EUV	7,758–107–29
W2UIG	7,580– 90–39
W2ASY	6,851– 95–29
W2JC	6,748–137–27
W2BXY	6,500–100–28
W2RGS	6,250–100–25
W2OYD	6,000– 80–30
W2WEO	5,775–106–22
W2QJY	5,265– 78–27
W2ANW	4,876–105–23
W6WDH/2	3,910– 87–23
W2BYK	3,744– 59–32
W2GQR	3,680– 64–23
W2CFW	2,970– 54–22
W2CFX	2,280– 38–10
W2IPJ	1,750– 35–20
W2ISV*	1,575– 35–18
W2CPJ	1,485– 33–18
W2JTM	660– 24–11
W2UGL	488– 20–10
W2IIN	384– 16–12
W2CJX*	260– 13–10
W2NZC	160– 21– 4
W2QWH	120– 9– 6
W2VMH	75– 6– 5
'Phone	
W2RVC	38,464–301–64
W2JKH	31,491–207–61
W2MLM	19,910–182–55
W2QEM	16,335–182–45
W2GKE	15,015–120–52
W2KHK	14,364–126–57
W2PCX	7,310– 86–34
W2CCS	4,572– 64–36
W2XKK	4,354– 65–27
W2FDL	3,400– 50–34
W2MGF	3,190– 55–29
W2KMK	1,836– 51–18
W2ESC	1,500– 38–20
W2UWK	650– 21–13

MIDWEST DIVISION

Iowa	
WØFZO	71,890–593–65
WØEQN	62,307–506–63
WØQVA	51,185–353–58
WØNDB	38,186–305–51
WØOZL	34,493–219–63
WØYNF	31,959–303–53
WØFGW	21,444–183–47
WØEGI	17,444–178–49
WØGDR	15,125–121–50
WØAQV	14,053–148–47
WØMGF	12,540–119–44
WØVOS	5,503– 71–31
WØOPK	3,600– 50–36
WØTFM	1,013– 27–15
WØJKT	875– 27–14
WØTHD	180– 12– 6
WØBEN	166– 10– 7
WØPVW	94– 8– 5
WØGPL	23– 3– 3
'Phone	
WØJKT	22– 3– 3
WØTFM	10– 2– 2
Kansas	
WØBQJ	108,306–666–65
WØDYX	103,673–601–69
WØDAE	98,640–411–64
WØAWP	78,795–464–68
WØBDU	62,075–383–65
WØDEP	57,300–382–60
WØSIL	31,972–222–58
WØOAQ*	21,550–150–58
WØTSA	14,670–163–45
WØAGC	11,150–114–40
WØSJP	6,035– 73–34
WØJEV	495– 23– 9
WØAAO	63– 5– 5
'Phone	
WØPAH	15,568–140–56
WØAAO	4,860– 73–27
WØIWS	2,162– 47–23
WØDYX	286– 13–11

(Continued on page 130)

Missouri

WØLLN	99,084–716–69
WØVEE	77,763–566–69
WØYKR	37,870–272–56
WØPWV	23,188–175–53
WØKCG	18,800–160–47
WØQDF	13,455–117–46
WØDPO	5,619– 78–29
WØZZW	3,915– 54–29
WØKIK	617– 19–13
WØKHD	473– 29–17
'Phone	
WØOMG	38,080–299–64
WØDEA	11,400–115–50
WØBVL	1,584– 33–24

Nebraska

WØDNW	103,515–620–67
WØQNP	35,910–266–54
WØFWW	22,064–197–56
WØZOQ	1,654– 32–21
WØINR	798– 21–19
'Phone	
WØRQK	30,656–241–64
WØGDB	13,750–126–55
WØZDV	863– 23–15

NEW ENGLAND DIVISION

Connecticut

W1RY	121,958–708–69
W1BIH	105,225–613–69
W1NMP	85,231–528–65
W1MTR	45,060–377–48
W1CA	41,745–253–66
W1LHE	40,625–325–50
W1GVK	35,100–272–52
W1OJM	32,465–305–43
W1IC	31,514–287–44
W1QAK	26,945–262–41
W1HV	17,500–126–56
W1MHF	17,325–266–33
W1FXS	15,120–128–48
W1MCI	14,820–124–48
W1QIS	11,354–152–31
W1BHM	9,504–132–36
W1DJC	6,816–107–32
W1JMI	4,608– 72–26
W1APA	3,375– 50–27
W1LKF	3,349– 71–19
W1IJO	3,094– 50–25
W1EFW	1,880– 47–16
W1TS[2]	93,113–573–65
W1FTX[2]	62,502–475–66
W1VG[2]	44,603–314–57
W1DX[2]	34,136–251–68
W1INF[2]	31,200–300–52
W1MUW[2]	20,000–200–40
W1DF[2]	15,675–110–57
W1PEK[2]	5,771–100–29
W1FWH[2]	4,270– 62–28
W1BDI[2]	3,939– 51–39
W1IIN[2]	550– 20–11
W1LVQ[2]	35– 4– 4
'Phone	
W1ATE	37,672–283–68
W1ON	10,340–111–47
W1MRP	8,750–125–35

Maine

W1GKJ	58,660–419–56
W1HUL	51,750–414–50
W1NXX	50,260–359–56
W1DEO	44,286–333–66
W1MDF	26,670–254–42
W1CRP	22,790–172–53
W1PGI	7,600– 81–38
W1PMY	2,074– 41–21
W1PDN/1	15– 3– 2
'Phone	
W1LOA	16,907–160–53

E. Massachusetts

W1VDY	105,105–642–66
W1LLX	77,452–578–67
W1OJM	76,370–574–70
W1BSG	70,875–450–63
W1OMI	69,750–465–60
W1EPE	68,930–452–61
W1AQE	68,661–468–59
W1LYL	56,856–433–66
W1NXY	56,342–369–62
W1KMY	49,088–293–67
W1PGR	43,903–320–58
W1PEG	39,928–358–56
W1NIY	31,125–248–50
W1IPG	25,245–198–51
W1PTR	22,863–161–59
W1LQQ	20,531–211–49
W1PH	18,000–200–36
W1IAP	17,556–234–38
W1JYC	15,240–128–48
W1MDV	15,022–203–37
W1JCE	14,788–169–35
W1DMS	12,925–121–44
W1MQX	8,000–127–32
W1NW	7,178– 97–37
W1GKM	6,210–108–23
W1QMJ	5,397– 87–25
W1IUQ	5,029– 75–27
W1OLV	4,569– 90–21
W1PYM	4,526–107–17
W1MD	4,110– 69–24

(Continued on page 158)

W1HY	3,780– 54–28
W1EMG	3,680– 64–23
W1PLJ	3,025– 56–22
W1QJB	3,000–100–12
W1AJ	1,444– 38–19
W1QFO	1,370– 35–16
W1JDP	990– 33–15
W1QGH	940– 24–16
W1JCK	870– 29–15
W1PLU	605– 24–11
W1OBN	575– 23–10
W1MKZ	500– 20–12
W1LNX	467– 17–11
W1HJ	442– 18–13
W1KWU	432– 18–12
W1NZB	23– 3– 3
'Phone	
W1JNX	26,460–223–60
W1PKV	20,750–166–50
W1KTE	12,446–127–49
W1PAW	10,680–100–44
W1PQY	9,520–124–32
W1PLK	7,124– 87–42
W1NBI	6,432–101–32
W1IIM	5,974–103–29
W1AAR	1,696– 53–32
W1OTH	1,520– 35–19
W1NYO	1,518– 37–22
W1OMI	1,395– 31–18
W1NKW	1,237– 33–15
W1NBL	1,054– 31–17
W1IFR	1,026– 27–19
W1PCO	420– 22–10
W1PVW	405– 18– 9
W1JDP	113– 9– 5
W1LCF*	63– 5– 5
W1ILS	28– 18– 1
W1FRZ*	6– 3– 3
W1MCR	3– 1– 1

W. Massachusetts

W1JYH	95,366–630–63
W1EOB	83,490–484–69
W1KJO	67,283–425–64
W1BKG	19,552–208–47
W1IJT	17,976–161–56
W1JE	15,693–140–45
W1MUN	14,526–136–54
W1KDW	13,240–192–27
W1AZW	12,023– 92–53
W1JGY	7,470–125–24
W1JLT	7,310– 85–43
W1KOS	4,750– 76–25
W1BEF	3,064– 65–19
W1BVR	810– 27–15
W1BDV	650– 20–13
W1OPJ	600– 62– 4
W1MOK	91– 7– 7
W1LLN	70– 7– 5
W1BBL	2– 1– 1
'Phone	
W1WL	28,968–213–68
W1COI	8,064– 84–48
W1OMJ	539– 25–11
W1OJA/1	385– 14–11
W1ENK	38– 5– 3
W1BDV	3– 1– 1
W1LSZ	2– 1– 1

New Hampshire

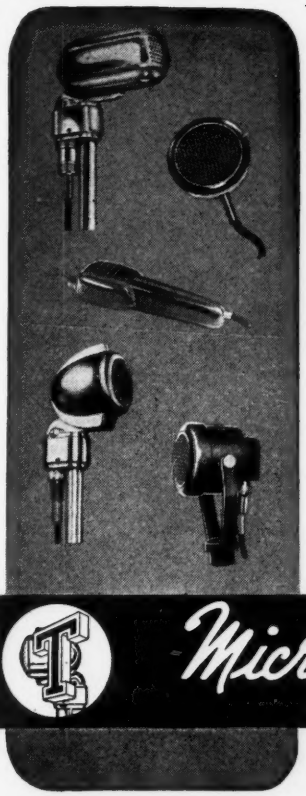
W1BFT	73,288–451–65
W1IJB	65,520–585–56
W1AVJ	60,984–484–63
W1CRW	49,875–400–50
W1AOQ	47,722–303–63
W3LCV/1	43,244–315–55
W1MXP	4,984– 89–28
W17PVF	4,364– 77–23
W1CNX	3,904– 62–32
W1QEU	2,835– 54–21
W1PFU	770– 22–14
W1FTJ	450– 18–10
W1IP	375– 15–10
'Phone	
W1BFT	25,925–170–61
W1HRI	18,395–142–52
W1APK	13,158–156–43
W1GEY	7,631– 83–37
W1EAL	3,720– 60–31
W1CNX	1,872– 39–24
W1FTJ	65– 5– 2

Rhode Island

W1LWA	100,800–627–64
W1CJH	78,275–506–62
W1LIV	59,280–456–52
W1PQM	22,790–216–53
W1AOP	15,587–218–29
W1BBN	13,920–116–60
W1BEH	2,048– 46–18
'Phone	
W1BIB	36,696–278–66
W1AJQ	12,096–127–48
W1HLK	2,625– 53–25
W1NCX	2,424– 51–24
W1QBX	2,200– 40–22

Vermont

W1AEA	5,669–103–27
W1BJP	2,525– 51–20
W1EWF	976– 31–16
W1GKA*	30– 5– 3
'Phone	
W1KNC	6,916– 91–38



DEPENDABLE

Turner 99 Dynamic

A true professional, the Turner Model 99 Dynamic is always ready to pick up your message and deliver crisp and clear. Engineered for utmost in dependability with smooth response not affected by changes in climate, humidity, or temperature. Built-in features minimize feedback, eliminate blasting. Adjustable saddle permits semi- or non-directional operation. Fits any standard microphone stand. Response: flat within ±5 db from 40–9000 c.p.s. Level: 52 db below 1 volt/dyne/sq. cm. at high impedance. Available in 50, 200, 500 ohms, or high impedance. Complete with 20 ft. removable cable set. Ask your dealer.

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THE TURNER COMPANY

917 17th STREET, N. E. • • • CEDAR RAPIDS, IOWA

Microphones BY TURNER

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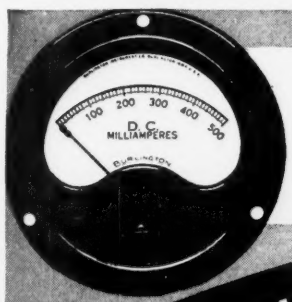
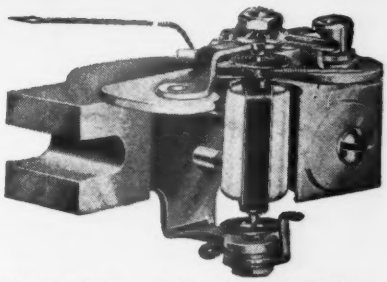


ONE OF A SERIES

GAUGED ALIGNMENT

WHY BURLINGTON PANEL INSTRUMENTS PROVIDE UTMOST RELIABILITY . . .



JEWEL SUPPORTS are machined and assembled with aid of precision gauging fixtures to assure perfect alignment. All ranges AC and DC available in 2½", 3½", 4½" rectangular or round case styles and are fully guaranteed for one year against defects in workmanship or material. Refer inquiries to Dept. J68.

Burlington INSTRUMENT COMPANY

BURLINGTON, IOWA

NORTHWESTERN DIVISION

Alaska

KL7NA	50,585–379–67
KL7CZ	24,168–214–57
KL7AT	6,308– 84–38
KL7AF	2,020– 51–20
'Phone	
KL7NB	980– 28–14
KL7AW*	85– 9– 5
KL7DD	40– 4– 4

Idaho

W7ZN	73,722–560–66
W7FBD	12,256–135–37
W7IY	2,871– 51–29
W7EMT	2,784– 48–29
'Phone	
W7JL	2,438– 53–23

Montana

W7KVU	59,630–357–67
W7FMV	35,164–299–59
W7EWR	33,068–241–55
W7JCU	19,494–182–54
W7LEP	840– 24–14
W7GBL*	160– 10– 8
W7IXL	2– 1– 1
'Phone	
W7YLO	25,584–246–52
W7IVY	15,550–156–50
W7HEM	6,696–110–31
W7LPD	753– 22–14
W7CPY	384– 16–12

Oregon

W7FZA	115,834–673–69
W7HKT	78,798–573–69
W7EVR	74,425–465–65
W7GEB	61,425–475–65
W7COB	57,984–453–64
W7DIS	33,170–272–62
W7BWD	32,550–217–60
W7ECI	27,810–225–54
W7BOH	16,065–126–51
W7JMZ	13,090–155–34
W7KOV	3,430– 49–28
W7LBV	764– 24–13
W7ABH*	676– 26–13
W7HBO	416– 14–13
W7KEG	324– 15–12
W7LNG	317– 23–11
W7LKD	228– 13– 7
'Phone	
W7GUX	22,894–177–55
W7GNJ	19,500–163–60
W7HHH	988– 26–19

Washington

W7GUI	88,734–645–69
W7KEM	78,738–597–66
W7BE	72,243–522–69
W7AKP	68,640–520–66
W7KMU	48,050–312–62
W7KWC	46,400–363–64
W7KIH	43,130–208–56
W7LAR	41,229–268–62
W7ZU	31,500–230–56
W7GHB	28,814–198–61
W7AJS	28,210–234–62
W7JC	19,580–179–44
W7FWD*	8,663–165–21
W7LCS	6,958–127–22
W7ETO	3,465– 63–22
W7DP	3,348– 62–27
W7DGN	1,556– 42–15
W7CWN	495– 22– 9
W7LIL	375– 26– 6
'Phone	
W7KRM	34,880–218–64
W7BLX	14,168–162–44
W7JEO	4,921– 68–37
W7FWR*	800– 26–16
W7LEV	270– 12– 9

PACIFIC DIVISION

Hawaii

KH6IJ	60,573–500–61
KH6AB	13,340–150–46
KH6IB	400– 18–10
'Phone	
KH6BD*	32– 4– 4

Nevada

W7ONG	98,000–703–70
W7KEV	96,985–571–68
W7JO	19,998–195–54
'Phone	
W7JUO	2,912– 56–26

Santa Clara Valley

W6MUR	92,229–650–71
W6RDP	87,450–534–66
W6GWW	74,900–535–70
W6GTI	62,764–461–68
W6PBV	24,472–220–56
W2OMC/6	21,654–201–54
W6NEQ	17,100–154–45
W6ZGG	16,448–129–51
W6SSA	14,291–155–37
W6GEU	4,320– 68–32
W6KJG	840– 30–14
'Phone	
W6MLY	65,540–383–69
W6HAN	59,400–455–66
W6DZE	21,376–167–64
W6YGX	1,033– 28–14
W6ZBS	796– 25–13
W6SBE	598– 24–13
W6ZYC	540– 18–12
W6UKO	504– 18–14
W6QJV*	2– 1– 1

East Bay

W6MVQ	95,200–680–70
W6TT	85,000–625–68
W6RM	82,248–596–69
W6KEK	72,410–557–65
W6NGC	37,230–292–51
W6TI	34,456–277–64
W6TMP	25,250–203–50
W6LMZ	23,108–218–53
W6VDG	17,998–157–46
W6DLX	13,500–135–50
W6EJA	10,164–116–44
W6EY	2,502– 77–26
W6KZG	2,100– 56–15
W6LDD	1,900– 38–25
W6QAZ	280– 14– 8
W6CMG	128– 8– 8
W6DUB	4– 2– 1
'Phone	
W6IKQ	36,918–303–63
W6UZX	20,608–187–56
W6UPV	9,348–114–41
W6VEF	6,549– 86–31
W6DUB*	2,632– 47–28

San Francisco

W6WNI	78,472–577–68
W6MHF	75,375–455–67
W6WB	73,761–535–69
W6EYY	36,032–285–64
W6RBQ	28,830–235–62
W6YYU	13,056–128–51
W6GMF	12,760–116–44
W6II	6,683–100–27
W6MMG	5,130– 76–27

Sacramento Valley

W6ZS	21,100–163–53
W6REB	17,698–192–47
W6UIE	10,094–103–49
W6EFM*	1,748– 38–23
W6GZY	310– 16– 8
'Phone	
W6EOU	21,231–171–63
W6WLI	13,056–129–51
W6VYW	5,280– 80–33
W6ZQD	3,810– 64–30

San Joaquin Valley

W6SRU	71,139–522–69
W6BVM	66,096–499–68
W6WI	46,662–366–66
W6UTU	24,500–196–50
W6PLJ	18,169–145–51
W6EUH	8,525–111–31
'Phone	
W6QEU	60,375–353–69
W6ILH	14,650–135–40

ROANOKE DIVISION

North Carolina

W4KTD	75,569–500–61
W4CFL	58,800–419–56
W4FDV	45,136–403–56
W4TP	27 140–230–59
W4LYV*	10,764–105–52
W4DQ	1,240– 31–20
W4MOC	650– 20–13
'Phone	
W4IZR	2,300– 42–23
W4MOE³	4,588– 74–31

South Carolina

W4FNS	8,930– 98–47
W4EZF	6,270– 76–33
W4CZA	408– 18–12
W4HXZ*	2– 1– 1
'Phone	
W4GVD	5,977– 72–43
W4EZF	8– 2– 2
W4GUZ*	2– 1– 1

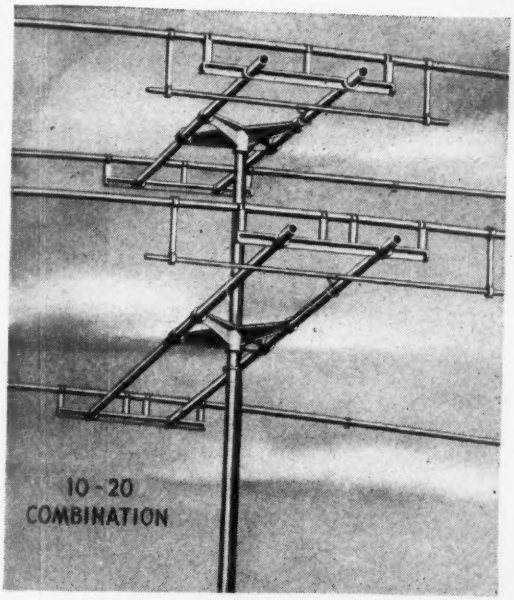
Virginia

W4KFC	156,750–923–68
W4LOI	114,972–868–67
W4KFT	100,750–620–65
W4MKM	73,552–467–63
W4LUE	70,136–477–59
W9NWX/4	66,375–444–60
W4IA	58,820–348–68
W4LRI	52,635–364–58
W4KJT	50,630–332–61
W4KMF	48,124–463–51
W6FZH/4	445,225–302–60
W4IRZ	42,840–272–63
W4IPC	39,772–326–61
W4FV	37,365–282–53
W4RQR	33,920–257–53
W4KVM	29,813–268–45
W4QWM	27,313–220–50
W4EEY	23,664–232–51
W4IWO	19,665–173–57
W4BTO	19,552–208–47
W4IUR	17,118–168–41
W4EII	15,042–163–46
W4KCX	13,343–153–35

(Continued on page 134)

2 ELEMENT 10-11
2 ELEMENT 20
STACKED

FOR ONLY $65.00
WITH 2 T MATCHES



HY-LITE now offers the ham a stacked 10-11, 20 meter rotary combination beam, built of the same rigid, high quality, all aluminum construction that has made HY-LITE the choice of discriminating hams everywhere.

The illustrated version is equipped with 2 T matches and full instructions for tuning. The 10-11 meter section can be had with extra elements at an additional cost, either at the time of purchase or at any later date. (Available to HY-LITE owners only.)

HY-LITE Beams stacked are so constructed that a 6 meter and/or a 2 meter beam can be stacked on top. This is only one of the many fine features of the HY-LITE Rotary Beams.

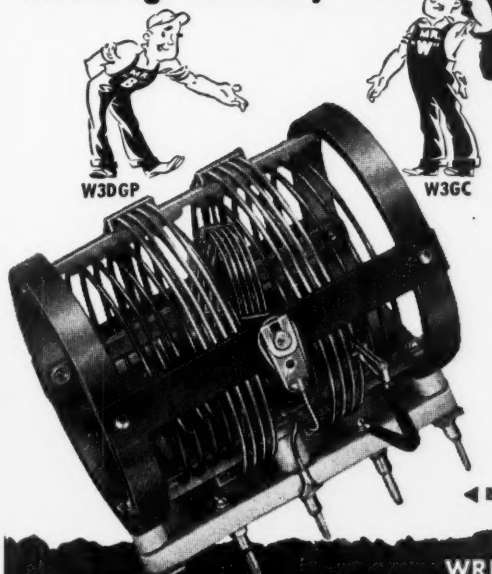
The 10-11 meter beam uses 5/8 and 3/4 inch telescopic elements with 1 inch supporting tubes. The 20 meter beam uses 7/8 and 1 inch telescopic tubing and 1 inch supporting tubes. The rigid, all aluminum castings are provided with lock screws and are insulated from the elements with heavy Steatite insulators.

Write for further information on this and other HY-LITE Beams.

HY-LITE Antennae INC.
Makers of Fine Antennas for AMATEUR · FM · TELEVISION
528 TIFFANY ST., BRONX 59, N.Y.

For Complete Load Matching Flexibility . . .

B & W SERIES "3400" INDUCTORS



B&W Series 3400 Air Wound Inductors are for those discriminating Amateurs with medium power transmitters who want the finest that money can buy in sturdy construction and electrical flexibility. Each coil has an individual adjustable internal center coupling coil. The 40- and 80-meter coils are provided with supplemental external links in series with the adjustable internal coil for roughly adjusting the load. All Series 3400 coils will match non-reactive loads from 72 to 750 ohms . . . a feature providing ample flexibility for any rig!

◀ B&W Series 3400 Inductor—*for powers up to 500 watts*

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W4CFV	236– 12– 9
W4IPS	160– 9– 8
W4LFQ	105– 7– 6
W4KYG	63– 5– 5
'Phone	
W4IUO	17,608–142–62
W4KMS	11,098– 97–46
W4JNG	4,290– 65–33
W4FV	1,805– 38–19
W4JNY	504– 14–14
West Virginia	
W8RCN	101,238–623–65
W8PQQ	97,376–570–69
W8UEB	79,662–598–66
W8JM	75,600–432–70
W8UYR	50,600–369–55
W8NTV	20,700–207–40
W8CSF	9,477–122–39
W8MIP	7,525– 91–35
W8JJA	1,615– 43–19
'Phone	
W8TAP	22,568–203–56
W8QHG	1,332– 37–18

ROCKY MOUNTAIN DIVISION

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WØFRE	89,080–526–68
WØCDP	79,645–469–68
WØOTR	69,120–540–64
WØTSQ	25,116–242–52
WØGKW	21,973–190–47
WØSJT	13,420–123–44
WØQHI	8,629– 92–39
WØSGG	6,545– 78–34
WØKV	950– 25–19
WØSYA	585– 18–15
WØKHQ	525– 15–14
'Phone	
WØAZT	26,505–180–57
WØZIX	26,397–212–63
WØCBU	19,824–168–59
Utah-Wyoming	
W7HRM	72,933–529–69
W7PJS	59,400–365–66
W7OWZ	47,973–314–62
W7LE	41,860–323–65
W7KIY	10,290–100–42
W7UOM	8,288– 85–39
W7JHL	3,565– 62–23
W7KHI	388– 17–10
Phone	
W7ILL	15,240–192–40
W7LKQ	6,588– 86–31
W7HNI	6,474– 84–39
W7DIR*	23– 3– 3

SOUTHEASTERN DIVISION

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W4EDR	72,153–466–62
W4CDC	40,600–300–66
W4LSQ	23,875–193–50
W4DXB	15,839–172–47
W4LEN	3,879– 56–29
W4KUX*	986– 29–17
W4FSZ	230– 12– 8
'Phone	
W4JYB	38,464–303–64
W4KCQ	17,888–172–52
W4LZX	13,213–152–35
W4HA	11,000–110–50
W4KUX*	5,440– 78–34
W4BA	72– 9– 4
East Florida	
W4BRB	94,360–676–70
W4GOG	76,797–557–64
W4IZ	76,608–609–63
W4FNR	53,922–413–66
W4FFF	48,900–326–60
W4ILE	47,336–401–61
W4FPK	32,132–277–58
W2TAC/4	29,512–264–56
W4LSV	23,784–179–53
W4FWI	23,320–220–53
W4IYT	12,420–138–45
W4BT	9,020–110–41
W4LAP	4,800– 64–30
W4LSW	4,515– 65–28
W4QV*	4,305– 64–35
W4CY	3,840– 64–24
W4HKJ	3,213– 60–27
W4IMI	2,340– 36–26
W4FWZ	2,075– 42–25
W4DWU*	24– 4– 3
'Phone	
W4CPG	18,720–182–52
W4AGB	15,606–146–54
W4HKJ	198– 12– 9
W4BXL	123– 7– 7
West Florida	
W4TL	25,520–222–58
W4AXP	12,600–127–50
W4MAX	11,205–127–45
W4FDL	11,172–133–42
'Phone	
W4HIZ	16,874–144–59
W4MS	15,138–131–58
Georgia	
W4FIJ	70,819–529–67
W4KSZ	41,004–309–67
W4DXI	31,992–258–62
W4GGD	16,609–157–43
W4JII*	98– 7– 7
'Phone	
W4HHU	24,522–201–61
W4JPQ	3,071– 51–27
W4DIA	1,916– 37–21
W4DXI	48– 6– 4
W4HWS	45– 15–12
West Indies	
KP4FH	26,399–217–49
CM2SW	19,722–175–57
W5KWY/KS4	14,231–127–45
KP4EZ*	2– 1– 1
'Phone	
KP4CK	23,548–205–58

SOUTHWESTERN DIVISION

Los Angeles	
W6HZT*	155,488–893–70
W6AOA	122,648–711–69
W6NNV	87,010–623–70
W6WIP	84,000–600–70
W6BPD	73,209–535–69
W6JFJ	62,436–473–66
W6WIR	59,055–381–62
W6BXL	54,653–347–63
W6IWX	35,967–320–57
W6ACL	30,318–245–62
W6AX	28,731–236–61
W6SDK	27,560–212–52
W6VAQ	24,613–178–55
W6ZVJ	23,274–199–47
W6ETJ	21,320–164–52
W6LBQ	20,460–187–55
W6TGY	18,675–167–45
W6WQC	15,400–154–40
W6MND	12,960–144–45
W6WOO	12,439–163–31
W6IOX	10,845–121–45
W6AJQ	9,010–106–34
W6TDO	6,218–100–25
W6YNR	4,611– 60–31
W6EGE	2,262– 44–26
'Phone	
W6AM	63,717–477–67
W6OGZ	62,846–471–67
W6YQQ	24,304–221–56
W6AGT	23,562–233–51
W6QMJ	14,840–143–53
W6BJU	11,172– 99–57
W6BUK	5,610– 85–33
W6AEE	5,440– 68–40
W6HS	5,328– 74–36
W6ZDU	2,496– 48–26
W6RNN	1,815– 33–22
W6NWP	1,387– 37–19
Arizona	
W7QAP	95,140–574–67
W7PUM	52,290–419–63
W7MLL	1,924– 41–19
W7LIH	135– 14– 4
W7LHI*	24– 4– 3
Phone	
W7AWA	21,808–192–62
W7RFE	13,450–136–40
W7LLO	560– 20–14
San Diego	
W6LDJ	137,568–802–69
W6EPZ	94,500–675–70
W6NIK	88,751–519–69
W6MI	68,759–411–67
W6AGO	25,500–213–48
W6WXW	22,968–199–58
W6JQX	19,916–171–47
W6NEC	13,776–148–48
W6WSS	13,622–139–49
W6QOJ	12,470–145–43
W6YZD*	8,652–105–42
W6UWL	865– 27–13
W6YYW	630– 21–12
W6FCT*	428– 19– 9
'Phone	
W6CHV	44,370–261–68
W6APG	12,267–131–47

WEST GULF DIVISION

Northern Texas	
W5MMT	86,295–531–66
W5BLU	63,211–416–61
W5RG	56,080–351–64
W5LIU	55,760–350–64
W5RIM	45,300–379–60
W5DWO	37,555–260–58
W5BXM	27,600–230–60
W5AWT	20,125–168–50
W5LSN	15,561–274–57
W5MXE	13,450–136–40
W5MMR	4,290– 72–30

(Continued on page 136)

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Magneto-Induction PICKUP

● Yes, this is it! A radically new pickup cartridge that opens broad new vistas of listening pleasure. The Astatic Magneto-Induction Pickup represents the first clean break with traditional principles employed in the manufacture of magnetic type reproducers. Discarded now is the need for delicately spaced "air gaps," which collect lint and dust, become a prime source of trouble in other type magnetic pickups. Their elimination in the Magneto-Induction cartridge is a newly opened door to peak fidelity of reproduction that is stable and trouble-free, even under the most consistent service or adverse climatic conditions.

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*Provides increased shielding effect for maximum reduction of hum.

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Here are the OUTSTANDING FEATURES

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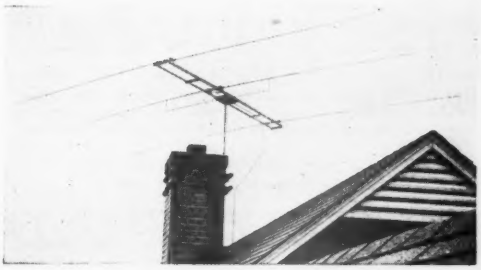
Complete PREMAX Rig For 6, 10, 11 Meters

High-Gain Directive Antenna With Elements, Frame and Hardware

This Premax Three-Element Array provides in one kit a high-gain, directive Antenna that has many distinctive features and a high degree of flexibility not usually combined in one beam Antenna. Seamless Duraluminum Elements are readily adjustable in length for operation at optimum on the 6, 10 and 11-Meter bands. The steel frame is designed to minimize wind resistance and the complete assembly weight only 30 pounds.

All elements are provided with conveniently removable shorting plates at their electrical centers, facilitating tuning and the use of alternative form of feeding as described in A.R.R.L. Radio Amateur's Handbook.



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W5LIU	210– 11– 8	
Oklahoma		
W5LW	106,750–610–70	
W5AQE	38,812–315–62	
W5EGO	14,352–152–48	
W5IOW	9,600–120–40	
W5GCM	5,508– 78–36	
W5NBN*	3,145– 37–34	
W5NBZ	935– 27–14	
W7LGP/5	748– 23–13	
'Phone		
W5EHR	26,845–207–52	
W5EIO	18,800–162–47	
W5KYG	12,765–112–46	
W5JME	11,978–143–37	
W5ERY	5,040– 64–40	
W5LRY	198– 11– 9	
W5JCY*	8– 2– 2	
Southern Texas		
W5LGG	130,463–749–70	
W5HLK	78,127–474–66	
W5GKI	76,065–463–66	
W5LFM	74,370–444–67	
W5GEL	72,448–567–64	
W5JPC	54,000–360–60	
W5FZU	44,730–321–56	
W5EWZ	44,118–393–57	
W5FNA	41,600–320–65	
W5DAA	40,494–249–55	
W5NQI	35,981–255–57	
W5DAQ	35,400–300–60	
W5FZA	30,645–227–54	
W5BTS	28,783–205–58	
W5LDU	25,819–203–51	
W5NIY	24,500–140–70	
W5BE	22,525–213–53	
W5CXS	17,623–133–53	
W5LBC	15,688–126–50	
W5UB	11,300–116–40	
W5EUK	6,638– 76–35	
W5ACL	3,300– 56–30	
W6SHZ/5*	2,530– 45–23	
W5NNK	1,755– 39–18	
W5MIQ	900– 30–12	
W5SC	757– 25–14	
W5KNA	384– 16– 8	
W5MPE	23– 3– 3	
'Phone		
W5KAC	38,400–240–64	
W5FH	30,954–235–66	
W5IGS	26,933–171–63	
W5BDI	17,385–143–61	
W5LHI	13,120–161–41	
W5MTA	12,432–148–42	
W5NKY	2,938– 48–25	
W5HQR	1,188– 44–27	
W5IPW*	18– 3– 3	
New Mexico		
W5NID	41,745–381–55	
WØFEA/5	28,532–208–55	
W5AFU	27,267–224–61	
W5VN	9,204–117–39	
W5JYW	5,280– 66–32	
W5KWP	4,950– 60–33	
W5KWR	3,300– 55–30	
W5HJF	198– 22– 9	

CANADA

Maritime		
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VE1KJ	51,910–358–58	
VE1PQ	45,012–341–66	
VE1EV	25,041–250–51	
VE1CU	23,575–205–46	
VE1EK	20,212–194–42	
VE1DB	12,432–150–42	
VE1IM	11,385–127–36	
VE1TF	8,450– 88–40	
VE1HG	4,277– 60–29	
VE1FB*	2,418– 47–26	
VE1QZ	960– 24–16	
VE1SW	23– 3– 3	
'Phone		
VE1QZ	1,785– 34–21	
VE1DQ*	8– 2– 2	
VE1CE	5– 2– 2	
VE1MZ	4– 2– 2	
Ontario		
VE3KE	96,050–567–68	
VE3EF	75,040–561–67	
VE3EK	74,370–444–67	
VE3GT	61,840–390–64	
VE3AEM	59,875–481–50	
VE3AGX	55,957–415–54	
VE3AHV	52,227–417–63	
VE3JJ[4]	50,873–357–57	
VE3BBR	50,530–329–62	
VE3ACB	47,973–311–62	
VE3AWE	47,430–372–51	
VE3ANO	41,753–294–57	
VE3BHX	37,088–322–46	
VE3MI	34,075–290–47	
VE3AJP	33,318–331–54	
VE3SF	32,066–241–58	
VE3VZ	31,290–224–56	
VE3BLY	25,960–237–44	
VE3AVN	25,241–191–53	
VE3BOC	22,106–198–45	
VE3AVA	21,372–206–52	
VE3BNA	14,670–165–45	
VE3DU	14,202–150–38	
VE3AZZ	13,360–167–40	
VE3ABP	12,920–154–34	
VE3DH	9,418–140–34	
VE3BAX	8,415–101–34	
VE3BJV	7,210–103–28	
VE3BL	6,642–123–27	
VE3AMK	6,118– 86–38	
VE3AQV	2,066– 44–19	
VE3ASD	1,800– 72–20	
VE3BNS	1,564– 34–23	
VE3BBQ*	1,538– 41–15	
VE3BMG	1,440– 60–24	
VE3BMI	1,400– 36–16	
VE3BAJ	412– 17–10	
VE3BPD*	180– 10– 9	
'Phone		
VE3AIB	27,675–185–60	
VE3AQB	26,460–210–63	
VE3BDY	20,663–147–57	
VE3UD	12,250–124–50	
VE3AUQ	11,388–111–52	
VE3AMK	8,428– 87–49	
Quebec		
VE2FG	48,870–362–54	
VE2QB	35,775–270–53	
VE2VL	29,768–222–54	
VE2OL	18,040–176–41	
VE2GL*	702– 27–13	
VE2WZ	645– 22–12	
VE2LO	481– 18–11	
'Phone		
VE2UJ	19,266–171–57	
VE2SE	12,272–118–52	
Alberta		
VE6AO	75,372–585–66	
VE6EO	45,293–287–66	
VE6BU	42,185–331–65	
VE6GD	39,308–320–62	
VE6AB	21,070–178–49	
VE6WG	13,770–135–51	
VE6DK	10,335–106–39	
VE6OS	1,317– 31–17	
W2TCP/VE6*	8– 2– 2	
'Phone		
VE6FK	29,504–235–64	
VE6GR	10,035–112–45	
VE6PY	4,932– 72–36	
British Columbia		
VE7ZM	85,818–505–69	
VE7ALE	65,650–404–65	
VE7EH	52,416–414–63	
VE7IQ	41,738–269–63	
VE7XA	30,000–250–48	
VE7ACS[5]	20,638–218–48	
VE7AC	16,830–165–51	
VE7CE	15,510–141–44	
VE7FG	12,163–140–35	
VE7AHP	10,500–108–40	
VE7JO	9,500–100–38	
VE7CU	7,425– 99–30	
VE7UI	5,400– 72–30	
VE7OK	3,325– 70–19	
VE7ABQ	2,719– 45–25	
VE7ID	2,610– 58–18	
VE7RU	2,156– 38–23	
VE7AFI	2,048– 63–13	
VE7AER	640– 35–10	
'Phone		
VE7AHH	12,740–104–49	
VE7VO	3,443– 52–27	
VE7ALM	3,100– 51–25	
VE7IM	972– 27–18	
VE7AET*	2– 1– 1	
VE7WL*	2– 1– 1	
Yukon		
VE8AY	34,272–275–63	
'Phone		
VE8AK*	24– 4– 3	
Manitoba		
VE4AM	8,483– 87–38	
VE4PK	1,378– 29–19	
VE4NX	75– 6– 5	
VE4CA	63– 5– 5	
VE4WE	2– 1– 1	
'Phone		
VE4RP	20,518–142–58	
VE4YO	16,448–129–64	
Saskatchewan		
VE5MQ	50,111–291–69	
VE5DW	41,398–289–58	
VE5QZ	33,016–219–61	
VE5CO	31,392–220–58	
VE5MS	16,675–154–46	
VE5HR	7,515– 84–36	
VE5KJ*	75– 6– 5	
'Phone		
VE5MWI*	195– 13– 6	

[1] W3KUY 4 oprs. [2] Hq. staff members not eligible for awards. [3] Two oprs. [4] West Side Radio Club. [5] Seven oprs. [6] W6HJT operator.